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The Cause of American Competition

Not because we believe that it is good policy for us Americans to "pat ourselves on the back," nor because we wish to exhibit an assumption of superiority to others, but because we believe the letter that follows on this page, entitled "American Competition," contains a lesson useful for us all to remember, we make room for it.

Not all, but nevertheless too many, of our American shop proprietors and others seem to forget what this Englishman clearly recognizes and boldly states, *i. e.*, that very much of our acknowledged superiority in certain lines of manufacturing and our success abroad come from the fact that American workmen and American employers were formerly in exactly the same social stratum, neither one claiming superiority nor acknowledging inferiority to the other. The workman of to-day has been the employer of to-morrow, has felt himself to be worthy of respect, and has commanded it.

There are those who believe that this condition of things is passing away. If it is, then we believe our American industrial development will by that receive a far more serious blow than it can possibly receive in any other way. The writer of the letter says: "Let us understand and thoroughly grasp the fact that the real inventive strength of a nation lies with the common workman, who labors steadily six days a week for a living. America treads on solid ground here, England on sand."

No truer or more significant words were ever written. We have previously stated our belief that to the brain work done by those who are employed in the shops in the actual work of construction, more than to any other single influence, do we owe our success in sending machine tools and other lines of machinery into the world's markets and successfully competing with foreign builders on their own ground, and it is our belief that, whether we apply the lesson to an industrial nation, to a manufacturing town, or to a single shop, that nation, town or shop will, other things equal, be most successful that does most to elevate the workman and gives the freest possible opportunity for the play of his mind. And this, of course, involves good wages, out of which come the good conditions of living that are a necessity for those who are to do important work.

We are convinced that the employer who grinds his workmen as much as possible, who "makes them know their places" and resents suggestions or even reasonable complaints from them, or who in any other way exerts an influence calculated to decrease their self-respect or to produce in them what may be called arrested mental development, not only prevents his own establishment from becoming what it might become, but does more or less injury to the entire industry with which he is connected.

There have been American engineers and others writing and speaking recently on the subjects of technical education and "American Competition" who need to learn thoroughly and well the lesson that the writer of the letter referred to evidently so well understands.

"American Competition."

To the Editor of "Engineering"—Sir: In my letter which you published on page 839 of your issue of December 29, I ascribed the cause of America's industrial advance to her facility in invention.

Let us now take a look at England's early material for raising a corps of inventors. It shall only be a look, for on going closely into the subject we find that to tell the plain truth would attack many cherished ideas, and lead us foul of some existing institutions. We have seen the kind of material that founded the mechanical world of the Yankees; in England no such material existed. The farm-laborer and the artisan, from which classes the rising industries drew their labor, were mechanics in the lowest sense of the term, doing their round of duties day by day in a dull, dogged style; thinking little of alteration or improvement in anything; kept down by class prejudice, woefully ignorant, few of them being able either to write or read. Borrow, who could not be accused of unfavorably misrepresenting his countrymen, describes the English working classes of his early days as dull, stupid and heavy. Instead of such workmen being equal in intelligence to the old Yankees, it is very probable that even their masters, the English so-called middle classes, were hardly on their level, and they were certainly not above it. Yet traditions and ideas handed down from a past of old ignorance and prejudice, mold to some extent the ideas of the English workman of to-day. One feels surprise at first that America has not long ago completely beaten England in the race; but we must remember that only within the last few years have the two countries come into sharp conflict, America having been heavily handicapped as a foreign trader by the immense continent she had to develop; but as that continent fills up more and more, her competition with Britain will grow keener. The battle has just fairly begun. The French Revolution, among other great lessons, taught a continent weighed down and nearly strangled by caste, that abundant military talent lay waste among the mass of the populace, ready to step to the front at a fair chance. Let us understand and thoroughly grasp the fact that the real inventive strength of a nation lies with the common workmen, who labor steadily six days a week for a living. America treads on solid ground here, England on sand.

The great majority of American inventions come from the ranks of the common mechanic or "working man," or from persons who began life in poverty. In England the common workman invents very little; most of our patents came originally

from members of the fairly well-to-do and educated classes, and most of them come from these classes still. The English "working" classes are comparatively waste material, as far as invention is concerned. But the whole traditions of the English mechanic seem to be against invention. Riots and destruction at the introduction of steam printing presses, steam looms and other steam machinery, are matter of common history; and the prejudice against new machines among many classes of mechanics is well known. Of course there is still a percentage of men who speak openly against the introduction of any kind of labor-saving appliance, but we need not waste space discussing them. The short-sighted Englishman, trembling for his "job," has had to have machinery forced upon him all through this century, and is trying to keep up the conflict still.

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Who can calculate the millions that Britain has lost by this suicidal purblindness? America began its industries with invention, and among American mechanics invention has always been the order of the day. Instead of employers having to force new machines on their workmen, the men themselves are constantly on the *qui vive* to invent new machines or improve old ones. Thus, a current that in England has always been against the inventor, in America carries his bark on its bosom and bears him triumphantly forward. And, needless to say, this same hope and probability of inventing something is an active stimulus to the American mechanic, making him a clever workman and increasing his intelligence. He is always encouraged, too, by his employers, who give bonuses and rewards; some masters undertake to pay all the patent expenses and experimental expenses of an invention, the patent becoming the workman's property on some arrangement allowing a fair benefit to the employer. The American workman takes altogether a higher place in the industrial world than the English one; there is not between him and his master that great gulf, bridged only perhaps by a foreman of narrow intelligence, which we too often see among ourselves.

The workman is expected to have intelligence enough to take part in frequent consultations regarding the work in hand. The master has no dignity to hurt by consulting his man; and this frequent intercourse between the two gives the master complete command of the details of his business and broadens the views, quickens the intelligence, and, above all, raises and supports the self-respect of the workman. He feels himself a man, an active, living intelligence, and not a mere iron-thumper. The conditions under which mechanics work in some English shops are enough to deaden the self-respect of even a superior man. The English employer, as well as the English artisan, stands accused of guilt for our backwardness in invention. When will they try to deserve each other's respect, instead of the one regarding the other as a kind of necessary nuisance? When will they learn that the interest of the one is the interest of the other; that what lowers the master in the standard of the world's industry is equally lowering the man? When will they unite in intelligence, active, earnest, kindly effort to restore British industry to the undisputed first place in the world? The workman too often has a feeling towards the master as of an enemy; when will he have intelligence enough to see in him a friend, or at least a fellow-workman? The time has come for the English employer to descend from his Stylites column and take a closer handling of the human material of his workshop, instead of leaving everything to a foreman or manager; and the time has equally come for the English workman to make a strong effort to raise his own standard of intelligence and knowledge; instead of, after having learned a trade, acting as if no more progress, either industrial or social, remained for him, and the great world would never outgrow the flea-bite of knowledge his apprenticeship had provided.

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Machinery must come more and more; our very existence as a manufacturing people depends on it. The Englishman has the clear choice put before him—let him bravely face the question, and bend all his brains and energies to produce the new machines and processes for himself; or let him go on in sullen apathy and opposition, and his employer will have to purchase shiploads of machinery from foreigners. But inventions will come in spite of him—for a time! until the nations use their own inventions to compete with his goods in the markets of the world; and the English, as the first industrial people of the world, will have become history—no more! Already many industries have practically passed away from us, others are steadily going. Watches and clocks, toys, pianos and organs, machine tools, axes, saws and hammers, locomotives, reapers, electric machines and appliances, steel rails, ironwork, have gone or are going to America. Typewriters elbow their way everywhere; and as the engineer looks over the new arrival for his office, there is the pleasing reflection that the presumed chief mechanical nation of the world is represented in this department by one solitary concern few people even in England know the existence of.

We are still first in shipbuilding, but what is to hinder the next decade finding the yards of Glasgow and the Tyne half empty, while those of Philadelphia, New York or Newport News resound with the clang of innumerable hammers? If the Yankees build ships at which one man and a machine do the work of three or four of our high-priced mechanics, with their ancient methods, how can we expect to hold our ground? The time has come to wake out of sleep. Many of our workmen seem to hold pretty much the same opinions about foreign industry as the Boers did about Thomas Atkins. Both parties are in considerable danger of being unceremoniously disenchanted! Invention in machines and processes is only part of the work, invention in workshop methods is equally necessary. American workmen are as good as English; it is certain they do more work for their money. The old opposition to machine work, to labor-saving devices, should be rightly regarded as an inheritance of narrow ignorance and selfishness, from the same century and source that hanged a man for stealing a sheep. If a machine can be invented or purchased to do a job quicker and more profitably than man, however small the difference may be, no pains or expense should be spared to get it. The time has gone by when the workman can hammer away (as his forefathers did a hundred years ago) until a new machine is shoved on the job before his nose.

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We need to improve our workshop methods, too; there are old errors to be got rid of, new ideas to be heartily embraced. We want more earnestness in the business of life, more enthusiasm. That is an excellent trait in the American character; they are an enthusiastic people, and what a force and pleasure there is in enthusiasm! You see the Yankee workman "hustling" with might and main, honestly working for the money he gets at the week end. In England there is, I grieve to say, far too much of the motto "Take it easy"—do as little work as possible for the most money possible. What a searchlight glare on the far-famed British workman appeared at the last strike of "engineers," when some apprentices were put to do the work of absent, full-fledged tradesmen. The apprentices were actually found to do more work in a given time than the journeymen, and to do it as well, if not better! What garrison nods drowsily while the enemy is storming at the gates!

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Our vast Empire and the navy and army we have to support make the drain on our country's inventive manhood very great; soldiers, sailors, government clerks, commercial clerks, colonial officials, emigrants—what a multitude there is of them all—are practically dead losses as inventors, and both America and Germany have great advantages over us in this respect. We can hope to make up for so much inventive waste only by giving special attention to invention among the men who remain at home. America's new expansion policy will likely prove an active factor in the ruin of the Republic, but that will not happen for some time yet; and till then, if England does not waken to her danger, the Republic's inventive genius will have time to encompass the ruin of England.

A PRACTICAL EXPORTER.

Commercial Review.

NEW YORK, SATURDAY EVENING,
January 20, 1900.

MACHINE TOOLS.

January has not proved a sensational month for machine tools thus far, from either a favorable or an unfavorable standpoint. Trade seems to be about as good as in December, which means that it is highly satisfactory even if not quite up to the record set by some months of last year. There are some large deals on foot, as ever, and a very fair business in additions to established manufacturing plants which, having a great quantity of work of their own on hand, are increasing their facilities.

It is generally admitted that deliveries upon the lighter lines of tools are becoming much shorter than they were; in fact, the degree of ease in getting hold of them seems to be increasing, and the exceptions to the lines plentifully obtainable are becoming fewer. Milling machines are still held back in some quarters, but even of these there does not seem to be the shortage that there once was. There are a good many light tools on the market of what may be considered second-class makes, and competition in small tools is keener than on heavy machinery, hence the supply sooner catches up to the demand. Heavy tools are still away behind on shipments, and the selling office is yet out of sight of the shop.

It argues well for the state of business that manufacturers are holding with almost universal firmness to the prices made last year. Values have reached a point where there is little disposition to go higher, so far as we hear—aside from one or two instances hardly worth mentioning—yet we dare not predict that evidences of new advances will not burst out at any time. It cannot be asserted, on the other hand, that nobody is shading prices. There were charges of certain dealers doing this not long since, as some will always do, but the complaint does not seem to be increasing. A Cincinnati lathe manufacturer, probably of no great prominence, was stated early this month to have reduced his prices at least for export, and there was a very vague rumor in another quarter this week that somebody or other talked about cutting down figures. Such insignificant citations as these chiefly go to show that the market, on the whole, is not softening, but is firm and strong.

A miscellaneous tool dealer on Liberty street informs us that trade is proving decidedly better this month than in December. The orders he has received have been for blocks of tools footing up to $5,000 or $10,000, rather than for larger contracts. Business that runs on about this footing is pronounced especially profitable and is preferred to an equal volume either in larger sales or in smaller ones. Such orders are more lucrative than a multiplicity of little ones, because the aggregate selling and clerical expenses connected with them are less. They pay better than large contracts, because the buyers do not take as much pains to shop about the market and get a great many estimates, resulting in the narrowest possible profit for the successful bidder. Thus, it is better to get three $5,000 orders than one $15,000 contract.

The Goodson Graphotype Company is to open a shop in a building on Morris and Hudson streets, Jersey City, for the manufacture of a typesetting and casting machine. A tool equipment has been ordered, including between forty and fifty Brown & Sharpe machines. The company think it may be necessary before long to establish a larger plant in a building of their own.

The contracts for equipment with machine tools of the new steam engineering machine shop at the New York Navy Yard, the awards of which were recently announced, have been received in machine tool circles with comparatively little murmuring among unsuccessful competitors. It is reported, however, that at least one company has filed a protest, based on the ground that some superfine tools offered were rejected for other machines at a higher price.

A protest such as this sometimes proves not unavailing. Secretary Long is understood to be a very fair man and disposed to rectify any obliquities of dealing that may be discovered in the Department. That is illustrated by a case which occurred upward of a year ago, as related by a bidder who then put in a protest. Specifications had been made out for twist drills, and the award had been given for a well-known make in preference to a comparatively unknown make at a lower price. The uncelebrated drills failed to conform to the specifications as to the nature of the angularity of the helix, and were, perhaps, rejected on that ground, but the bidder was confident that they were better drills than those of his successful competitor. He therefore went to Secretary Long, he states, and petitioned for a fair trial before the drills were finally rejected. An actual test was ordered, the unfamiliar drills were found to give the best results and the very official at the Navy Yard who before was determined to reject them now was in favor of their acceptance.

The Navy Yard contracts lately awarded were based upon estimates made several months ago, when prices ruled lower than at present. But, of course, manufacturers will stand by the quotations they put in. One manufacturer's representative looks upon it rather in the light of a benefit than an injury to his company to lose the award of some contracts bid upon, since the tools are easily salable in the general market at better prices than those named in the offer to the Government. Yet, on the other hand, there are advantages incidental to the Government contracts which in the minds of some manufacturers may counterbalance a little concession in price. The new naval shop in Brooklyn will make a good exhibition room for one's tools. It will be creditable to have them there, and the shop will be an advantageous place to show them off as samples. A seller sometimes desires to show to an intending purchaser certain tools in operation in a shop, but if it be a private establishment he naturally feels a hesitancy in asking permission to make repeated visits for that purpose. In this respect a Government shop is sometimes very convenient to have in the neighborhood.

Mr. W. S. Accles, English representative of the Niles Tool Works Company, who has returned to England after a visit to this country, will open up an exhibition wareroom in London for the company, who hitherto have had merely an office there.

The Electric Axle Light and Power Company, 100 Broadway, New York, is installing a lot of tools in the Hamilton Building, this city, where they will manufacture an apparatus for car lighting by means of a generator on the axle. Among the tools purchased are those of the Pratt & Whitney Company and the Brown & Sharpe Manufacturing Company.

MISCELLANEOUS.

The Anglo-American Rapid Vehicle Company is the name of a consolidation of five English and one American automobile companies, which has been incorporated under the laws of Delaware, with a capital of $75,000,000. It has offices in the Drexel Building, Philadelphia, and in the Commercial Cable Building, 20 Broad street, New York. At the latter it is explained that the company controls as one of its properties the patents on the Pennington oil motor, and that it will manufacture by contract with different American companies, as well as at the plants which it controls, automobiles for the world's markets. It is stated that the company has orders for 25,000 vehicles for England, France, Germany and other countries, and that many proposals for the sub-contracts are being received. Of the companies that have been merged into the Anglo-American Rapid Vehicle Company some were manufacturing and some commercial.

The Hooven, Owens & Rentschler Company made an advance of approximately 5 per cent. in the price of the smaller sizes of Hamilton-Corliss engines about the first of this month.

Henry James Kimman, mechanical superintendent of the Standard Pneumatic Tool Company, has just returned from a three months' European tour. In England he established works at Chippenham, near London, for the manufacture of the "Little Giant" pneumatic tools for the European trade, installing $50,000 worth

of improved machinery and appliances. He left the plant in full operation and turning out tools with great rapidity. Mr. Kimman found that the opposition to the use of pneumatic tools by labor organizations on the other side of the Atlantic on account of their labor-saving qualities is gradually dying out, and progressive concerns in all quarters are installing such machines. The Standard Pneumatic Tool Company reports that its export business has increased with remarkable rapidity during the past year. Its pneumatic drills, hammers and boring machines are being adopted by some of the largest foundries, shipyards, machine shops, railroad and boiler works and manufactories in Great Britain, France, Germany, Italy, Sweden and Russia. The company has recently received an order for $25,000 worth of pneumatic tools from a machinery dealer in Holland and other orders aggregating that amount from the other countries named. Its domestic business is also increasing, particularly with the railroads, and it announces that if the demand continues it will again enlarge its works.

CINCINNATI NOTES—AMONG THE FOUNDRIES.

Not only is Cincinnati a prominent market for pig iron, but it has become a very important point in the Central West for the sale of finished material. The tonnage for 1899 was enormously in excess of that of 1898. The agents of one of the largest rolling mills in the East, outside of combinations, report that the tonnage of it they sold last year showed an increase over 1898 of 800 per cent.; that three-fourths of the quantity was structural material, indicating for the building interests in the territory contiguous to the city a favorable growth along with other lines.

As bearing upon the manufacture of machinery, the output of foundries is important to note. A great change was manifested in the output of 1899 as compared with 1898, and still greater as against 1896. The Eureka Foundry Company state that where, in 1896, they were turning out possibly 150 tons of castings a month, last year they made 700 tons per month, or more than fourfold. The Hoeffinghoff & Laue Foundry Company in 1896 turned out 250 tons of castings per month, while in 1899 it produced 750 tons per month, or three times as much. They are employing 250 men and could give steady work to 325.

The demands on the foundries here have been so great that it has been impossible to fill orders for castings as promptly as the manufacturers desired. This being the case, it is the opinion of many that there is a good opening for a new large modern foundry complete in all its details, with the latest improvements. There has been some talk looking towards the establishment of such a foundry, and it is not impossible that ere this year ends it may be put into execution. Several new foundries are now under way. J. H. Day & Co., manufacturers of machinery of various kinds, after experiencing much difficulty in getting castings, decided to erect a foundry to make their own, in which, the correspondent is informed, they will use some 40 tons of iron per week. Daniel Sebastian and others have leased property formerly occupied by the Howell Wheel Company in Covington, Ky., and here $10,000 will be invested in building an up-to-date foundry wherein will be made castings for the Sebastian Lathe Company. The Haven Malleable Castings Company secured 3½ acres of land on Dane and Knowlton streets and the Cincinnati, Hamilton & Dayton Railroad a siding from which will run between the buildings. The main building will be 100x200 feet, for a foundry, one story high, and a pattern shop will be 30x100 feet, two stories high. The first floor will be used for the conveniences and comfort of the employees. A building 60x135 feet, two stories, will be used for the elevator department. Another, 60x165 feet, will be devoted to an engine room and annealing ovens and other purposes. The buildings will contain some 60,000 square feet of surface, giving employment to 250 men, and will cost, complete, upwards of $40,000.

CHICAGO MACHINERY MARKET.

Sales of machine tools at Chicago for the first two weeks of January were not uniformly good among the various selling agencies. Some report trade fair; others excellent. Several had during the first two weeks more business than during the whole of December. On the whole, trade may be said to be satisfactory. One large seller says his trade averaged up well for this period, because once in each three or four days a $5,000 or $8,000 order came in, some of them unexpectedly, making, in addition to the smaller sales, a gratifying total. Another seller, who is not complaining at the state of trade, says his business consisted almost entirely of small orders. The tools keep going to the old establishments, but a few new buyers are appearing. One representative said that one day last week he had inquiries from three superintendents of old manufactories, who said they were about to start in business for themselves and wanted complete outfits.

Woodworking machinery is in especially good demand. Trade is relatively better in the country than locally in Chicago, on account of the late strikes among the planing mills and piano factories. Furniture has been about the only recent active branch of wood-working manufacture at Chicago. But throughout the entire West the call for machinery exceeds supply. One house, which usually carries samples of nineteen kinds of saw tables, has not one left, and its stock of other lines has been similarly reduced. The plant is from thirty to ninety days behind in its orders. Without exception, sellers in this line of manufacture pronounce business brisk.

Rudolphi & Krummel have just added about 20 per cent. to their floor space and to their working force, and have installed a number of new tools. Orders are accumulating with them, and no year in their history has opened so auspiciously as 1900. The H. B. Smith Machinery Company report trade the best they have had in a long time, with inquiries increasing most rapidly. The Marshall & Huschart Machinery Company have sold during the first half of January more machines than during an average month's business during 1899, and have a number of inquiries, which promise considerable trade for somebody. Hill, Clarke & Co. have experienced a large trade so far this year. With them sales during the last six months of 1899 were far ahead of those for the first half of the year.

The Green Engineering Company reports sales of traveling link grates of about 40,000 horse-power in 1899, with prospects that sales in 1900 will reach 80,000 horse-power. In the Western avenue power house in this city they have installed twenty grates of 8,000 rated and 12,000 actual horse-power.

Quotations.

NEW YORK, Monday, Jan. 22, 1900.

Iron—American Pig, tidewater delivery—

Pennsylvania Irons:

No. 1 X foundry	$24 20 @ $24 70
No. 2 X foundry	23 20 @ 23 70
No. 2 plain	22 20 @ 22 70

Alabama Irons:

No. 1 foundry	22 75 @ 23 00
No. 2 foundry	21 75 @ 22 00
No. 3 foundry	20 50 @ 21 25
No. 1 soft	22 75 @ 23 00
No. 2 soft	21 75 @ 22 00
Foundry forge	20 25 @ 20 50

Bar Iron — Base sizes — Refined, mill price on dock, 2.15 @ 2.30c.; store price, 2.55 @ 2.60c.; common from store, 2.50c.

Tool Steel—Base sizes—Standard quality, 7 @ 8c.; extra grades, 12 @ 14c.; special grades, 16c. and upward.

Machinery Steel—Base sizes—Ordinary brands from store, 2.85 @ 3c.

Cold Rolled Steel Shafting—Base sizes—From store, 4 @ 4¼c.

Copper—Lake Superior ingot, 16½ @ 16⅝c.; electrolytic, 16 @ 16¼c.; casting copper, 15⅞ @ 16⅛c.

Pig Lead—Wholesale lots, 4.70 @ 4.75c., New York delivery; carloads, 4.72½ @ 4.77½c.

Pig Tin—In 5 and 10-ton lots, f. o. b., New York, 28¼ @ 29c., the latter for spot.

Spelter—Prime Western, 4.65 @ 4.75c., New York delivery.

Antimony—Cookson's, 11c.; Hallett's, 9¾c.

Lard Oil—Prime City, present make, 50 @ 52c. in jobbing lots.

A Lag-Screw Cutting Machine.

The interesting and ingeniously contrived machine which we here illustrate and describe has been designed for cutting screw threads upon lag-screws, which it does by a novel device. The machine itself is shown in half-tone in Figs. 1 and 2, and an enlarged view of the principal parts is given in Fig. 3. Fig. 1 will be considered to show the back of the machine and Fig. 2 the front. In Fig. 1 is seen a rotary oil pump, the pulley by which it is driven and the pipes below from the oil tank and above to the cutter, where, when running, a constant stream of oil is delivered. These parts need not again be referred to.

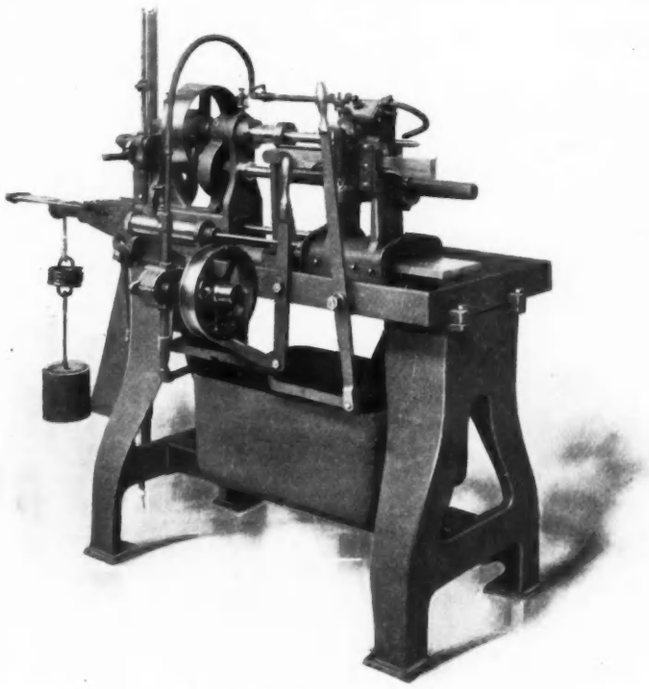


FIG. 1. BACK OF LAG-SCREW MACHINE.

Fig. 4 shows the general construction of the cutter and the principle upon which it operates, *b* being a lag-screw which is being cut and *c* the cutter, each revolving in the direction indicated by its arrow. The lag-screw and the cutter run together, just like a worm and a worm-wheel. The cutting face of the cutter is parallel to and in line with the axis of the lag-screw. The cutter, in fact, may be considered a worm-wheel which has been cut away by a plane at right angles to its axis and at the point of tangency of the worm. The cutter thus has numerous cutting teeth, all precisely alike, all equally operative and effective, each doing the same amount of work and subject to the same wear. The cutter may be sharpened and resharpened many times by simply grinding the face and raising the cutter correspondingly upon its vertical spindle for each grinding. This cutter is the most conspicuous object on the vertical spindle in Fig. 3. The cutting teeth have a helical inclination corresponding to the angle of the screw which is to be cut. With two screws to be cut, of the same pitch but of different diameters, the smaller would require a greater twist for the teeth of the cutter.

After the cutting begins the angle of the thread will cause the cutter to rotate, and it may then be fed along lengthwise of the screw at any speed that will give the proper cut to the teeth. Instead, however, of allowing the cutter to thus rotate of itself, it is found best to give it a positive and constant rotation by mechanical means. Accordingly, on the lower end of the cutter spindle there is a worm-wheel driven by a worm which is longer than any screw that the machine will be required to cut, so that the cutter spindle and its carriage may be moved any distance in either direction lengthwise of the machine without interfering with the correct lead of the cutter teeth.

The main spindle of the machine is hollow, and carries a socket for the head of the lag-screw, and this socket may be moved in or out of the spindle and adjusted according to the length of the screw to be cut. The round part of the lag-screw runs in a semi-circular hardened steel bearing on the side opposite to and above the cutter, to support it against the pressure and torsion of the cut. The screws to be cut are first pointed in another machine, and the cutting of the thread begins at the point. After the cutting begins, the cutter as it advances must be gradually moved out from the axis of the lag-screw to properly shape the point. When the full diameter of the screw is reached then there is no further lateral movement of the cutter as long as the straight part is being cut, but when that is finished the cutter then moves away enough to clear the screw entirely, when the carriage is moved back to begin the cutting of the next bolt, and so on. The machine runs continuously, each screw dropping out of the way when finished, and the operator puts in another and starts the feed by means of the long vertical lever in front of the machine, when the action becomes automatic until the cutting of the screw is finished.

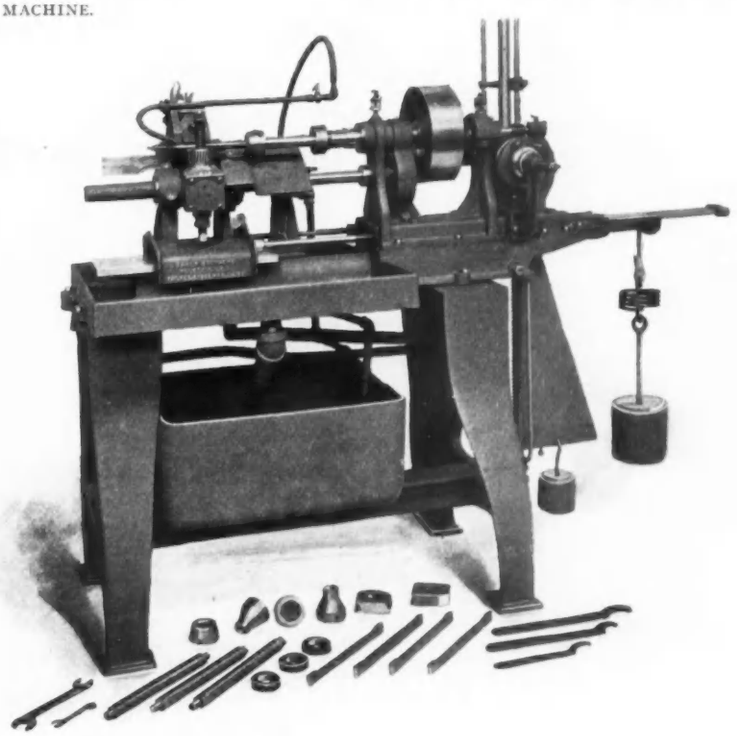
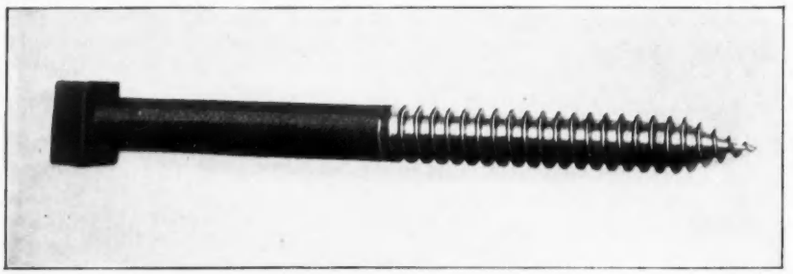


FIG. 2. FRONT OF LAG-SCREW MACHINE.

The lateral movement of the rotary cutter is not accomplished by a horizontal slide, but by swinging the cutter spindle carrier around the lead screw or worm. This will be understood by reference to



A SAMPLE OF THE WORK PRODUCED.

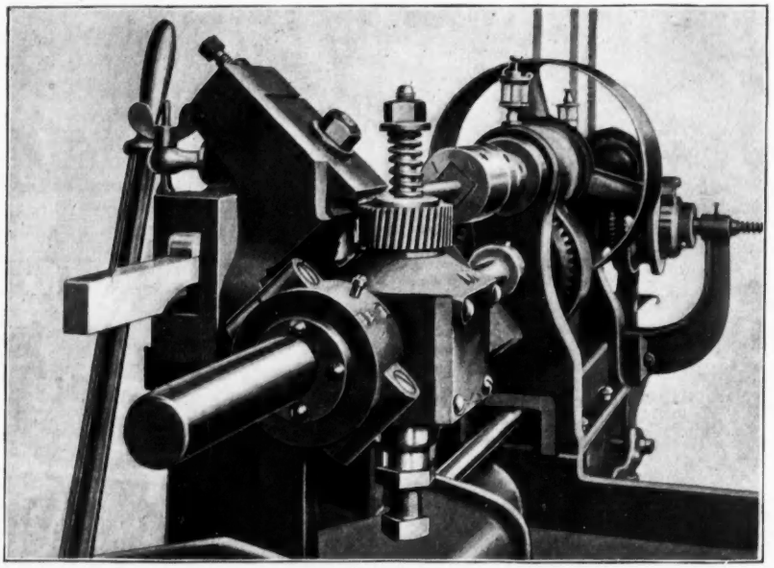


FIG. 3. ENLARGED VIEW OF CUTTER AND PRINCIPAL PARTS OF LAG-SCREW MACHINE.

Fig. 5, where the cutter spindle carrier *k* is carried by horizontal trunnions in uprights on the carriage. It is obvious that a depression of the arm *k'* will bring the cutting points in toward the center of the lag-screw, while an elevation of the arm will swing the cutter out from the center of the lag-screw, or cause it to cut a thread of larger diameter. The bar *n*, of rectangular section, is fastened rigidly to an upright upon the frame, so that when the carriage moves along it slides over this bar. The under edge of the bar is not straight, and against this edge works the roller *m* in a fork rigidly attached to the arm *k'*. Soon after the cutting of the screw begins the roller *m* comes to a portion of the under edge of *n* which curves upward, and this upward curvature, of course, allows the arm *k'* to rise and the cutter to swing away from the center of the lag-screw, thus forming the taper point. A straight portion of *n* then forms the parallel portion of the lag-screw, and a further rise allows the cutter to clear the screw entirely, when it drops out finished, and the carriage runs back, bringing the cutter in position to begin another cut. Roller *m* is held in contact with bar *n* by the pull of spring *o*.

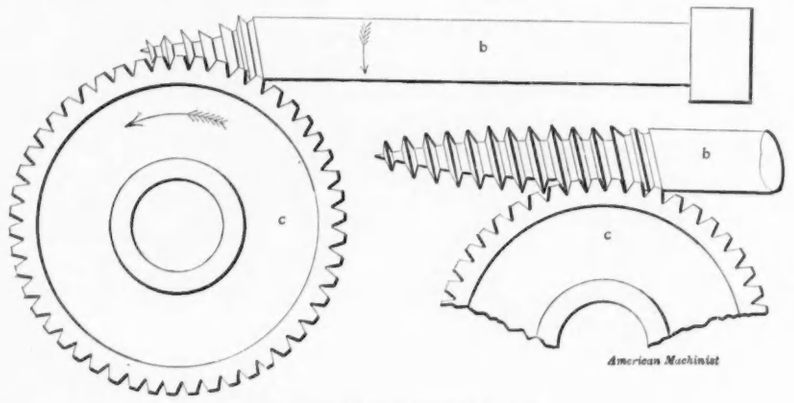


FIG. 4. HOW THE CUTTER WORKS.

The longitudinal feed of the carriage is not uniform, but is slower at first when cutting the point of the screw and faster when cutting the straight part of the thread. Attached to the center of the base of the carriage is a horizontal rod *p*, and this rod is attached to a sliding bar *q* (see Fig. 6), which parts may, in fact, be considered a part of the carriage, as they move constantly with it. Bar *q* for a considerable portion of its length is forked, and at the end of the fork is the roller *r* upon a horizontal pin. Additional rods,

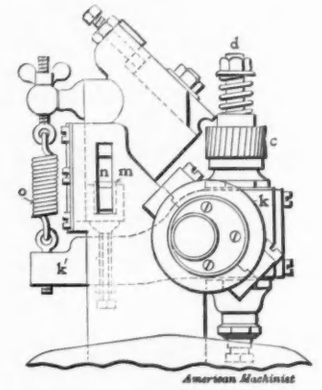


FIG 5. LATERAL MOVEMENT OF CUTTER.

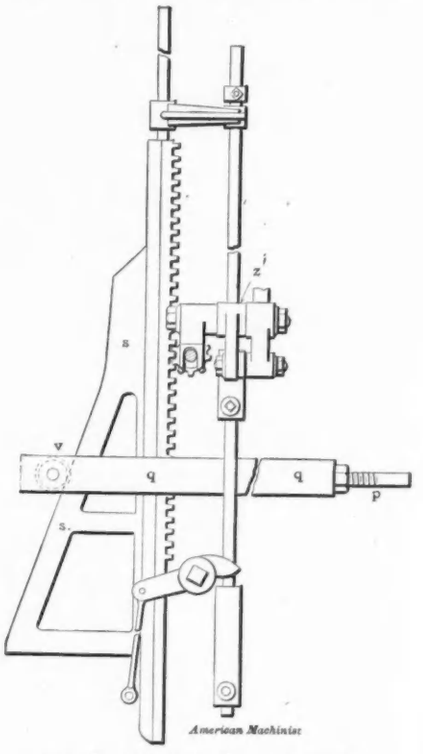


FIG. 6. SHOWING FEED OF CUTTER.

not shown in Fig. 6, but seen in Figs. 1 and 2, attached to *q* and extending in the same direction beyond the back end of the machine, are united by a crossbar, and to this is attached a cord passing over a sheave, and a heavy weight attached gives a constant backward pull to the carriage. In the cleft of bar *q* there is a thin sliding cam or frame *s*, working in a fixed vertical guide. The exposed edge of the cam *s* works against the roller *r*, being carried upward during the cutting operation by means of a rack and pinion. The working edge of *s* is inclined at three different angles for different portions of its hight. When it first begins to rise the roller *r* is in contact with a very steep incline, and the carriage is in consequence advanced rapidly to the position where the cutter is to begin its work. On the next portion of *s* the inclination is much less, and accordingly the cutter is carried along slowly while cutting the point of the screw. After this a long and steeper portion of *s* reaches the roller, and the cutter is fed faster to cut the long parallel portion of the screw. When the cam *s* descends, the carriage returns to its starting position. The pinion shaft for raising the slide has on it a worm-wheel operated by a worm on a little auxiliary shaft, which is geared to the main spindle. On the pinion shaft is also a clutch for releasing the drive and allowing the slide to descend. A vertical rod above the slide carries an adjustable finger, which may be set to operate the clutch at any point. This rod also at its upper end carries a piston moving in a dashpot to check the too sudden drop of the slide. A horizontal air cushion cylinder is also seen on the side of the machine for checking the backward movement of the carriage. The feed is thrown in by means of the long vertical lever in front of the machine. The shorter lever is only used to throw out the feed when necessary before the completion of the screw. The minuter details of construction and operation may be seen in Figs. 7, 8 and 9, which are, respectively, plan and back and end elevations from working drawings of the machine. This machine is made by Baker Bros., Toledo, Ohio.

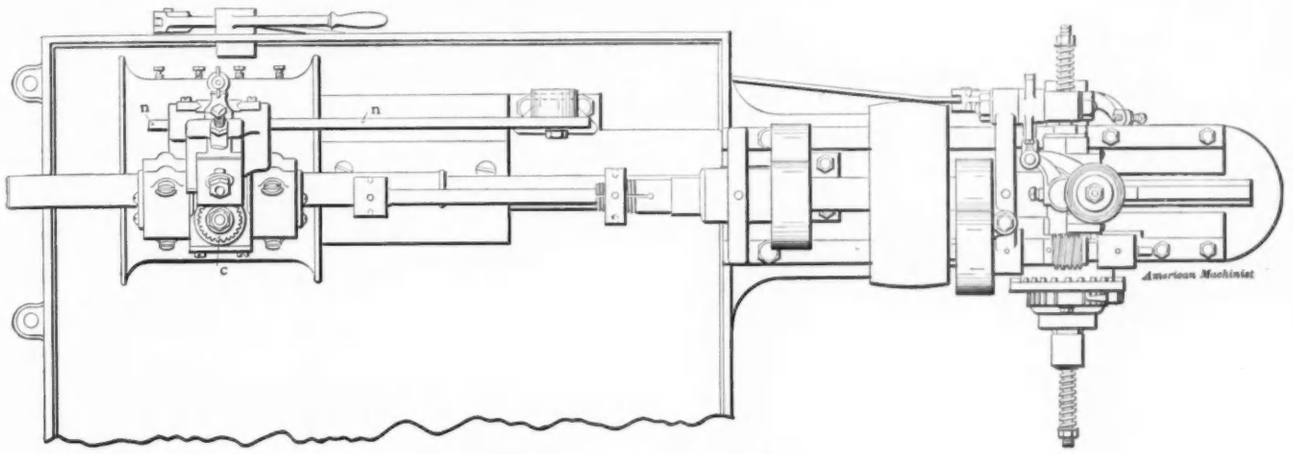


FIG. 7. PLAN OF LAG-SCREW MACHINE.

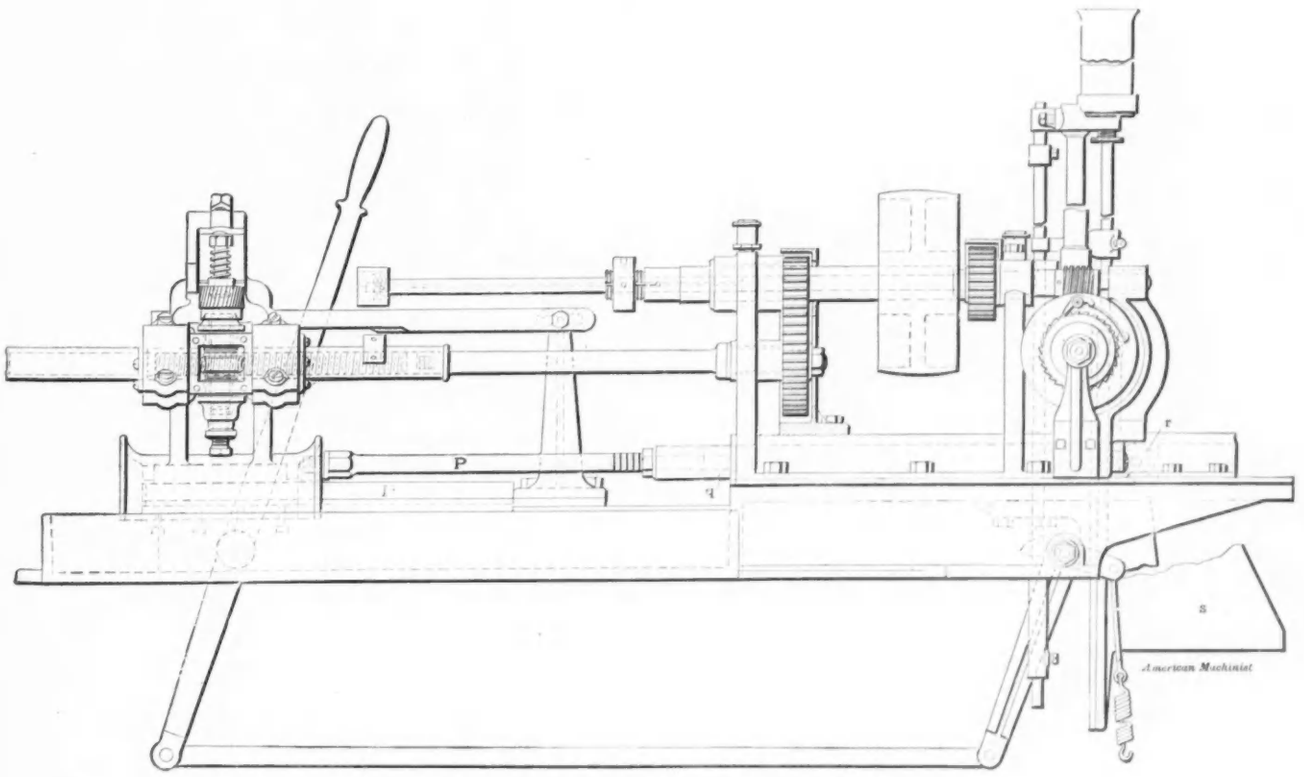


FIG. 8. SIDE ELEVATION OF LAG-SCREW MACHINE.

Economy in Design—Employment of Gravity.

BY W. H. BOOTH.

It is often attempted to perform by means of mechanical movements operations which would be far better carried out if the whole operation were performed at a different angle. Where an operation is one to which we are accustomed, it is one of the most difficult tasks of the designer to shake himself free of the trammels of the past, and this is one of the reasons why successful inventors are often found to spring from the outside ranks, for their minds have not been biased so strongly in some particular groove. The perfecting of a mechanical operation is very usually accompanied by simplification, and nothing so simplifies an operation as the utilization of the natural tendencies of the bodies operated upon.

One of the familiar utilizations of the law of gravity is that which we see in the screening of coal. To separate a large bulk of coal into its market grades would be most difficult to perform in a horizontal plane. It would require great complexity of mechanism to put the coal in movement over the sieves. Yet the operation is most easy if carried out on a plane inclined to the horizontal at a sufficient angle. The whole of the mixed coal is easily raised by a conveyor or elevator, so that gravity may be brought to bear upon it as it slides through a long, inclined cylindrical sieve, which grades the whole mass in one continuous operation. By keeping the cylindrical sieve in rotation we insure that each particle shall be free to escape through the proper mesh.

For years efforts were made by many inventors to perform the laborious operation of gas-retort stoking by machinery. The filling of a horizontal gas retort is very laborious work. Their discharging is still worse. Machines to charge horizontal retorts have been made, but have never been very successful, because the operation to be performed was done against Nature's laws. But if a gas retort be set in a sloping direction sufficiently to allow a mass of coal to distribute itself by gravity along the whole length of the retort, it becomes a very simple matter indeed to set up a traveller along the front of a bench of retorts, and, by the simple movement of a few levers, to fill a pocket of coal by means of a conveyor, and shoot that mass of coal into the top end of the retort. The more difficult operation of drawing the coked charge now simply resolves itself into removing the lower door of the inclined retort and allowing the contents to slide out into a trolley for removal or to a conveyor. The obvious one reason for success is of course that the operation is now carried out with the consent of Nature. Gravity is made the working agent, and that great retarder, friction, is utilized to restrain the too severe effect of gravity, and this frictional effect is simply secured by a proper choice of the angle of inclination of the retorts.

Let us take another instance of a machine which operates on thousands of exactly similar bodies one at a time in rapid succession. The horse-nail machine is an example of this class. In the horse-nail machine revolving roller dies project from the end of a vertical frame of spindles. The dies are carried on the ends of these spindles, and are seven or eight in number, vertically one above another, with a few inches of space between. A roll of wire is fed in at the top of the machine where it is chopped off in lengths of about ¾ inch. The pieces fall vertically through a guide tube and are seized and compressed between the top pair of roller dies They drop through another tube which turns them around, along their vertical axes, through an angle of 90 degrees. This allows the next lower pair of dies to squeeze them on the other two sides. In this way the pieces fall at a rapid rate through every set of tubes and rollers and arrive at the floor finished nails. Now this operation would be most difficult to perform along a horizontal plane, because something would be necessary to carry the pieces along.

In one form of linotype machine the letters are stamped on the edges of long slips of brass or steel, which are suspended on a number of wires so arranged that when released by a trip gear the long slip will slide down its wire by gravity and take its place in the line. When the line is cast, the slips which make it up are at once distributed by raising one end of the wire frame. This reverses the direction of slope and gravity thus puts back each letter to its place. By this use of gravity the mechanism of the machine is reduced to a minimum, that would be quite impossible if the force of gravity were not employed to do the movements.

I have long been of opinion that successful mechanical stoking cannot be effected upon a horizontal grate unless

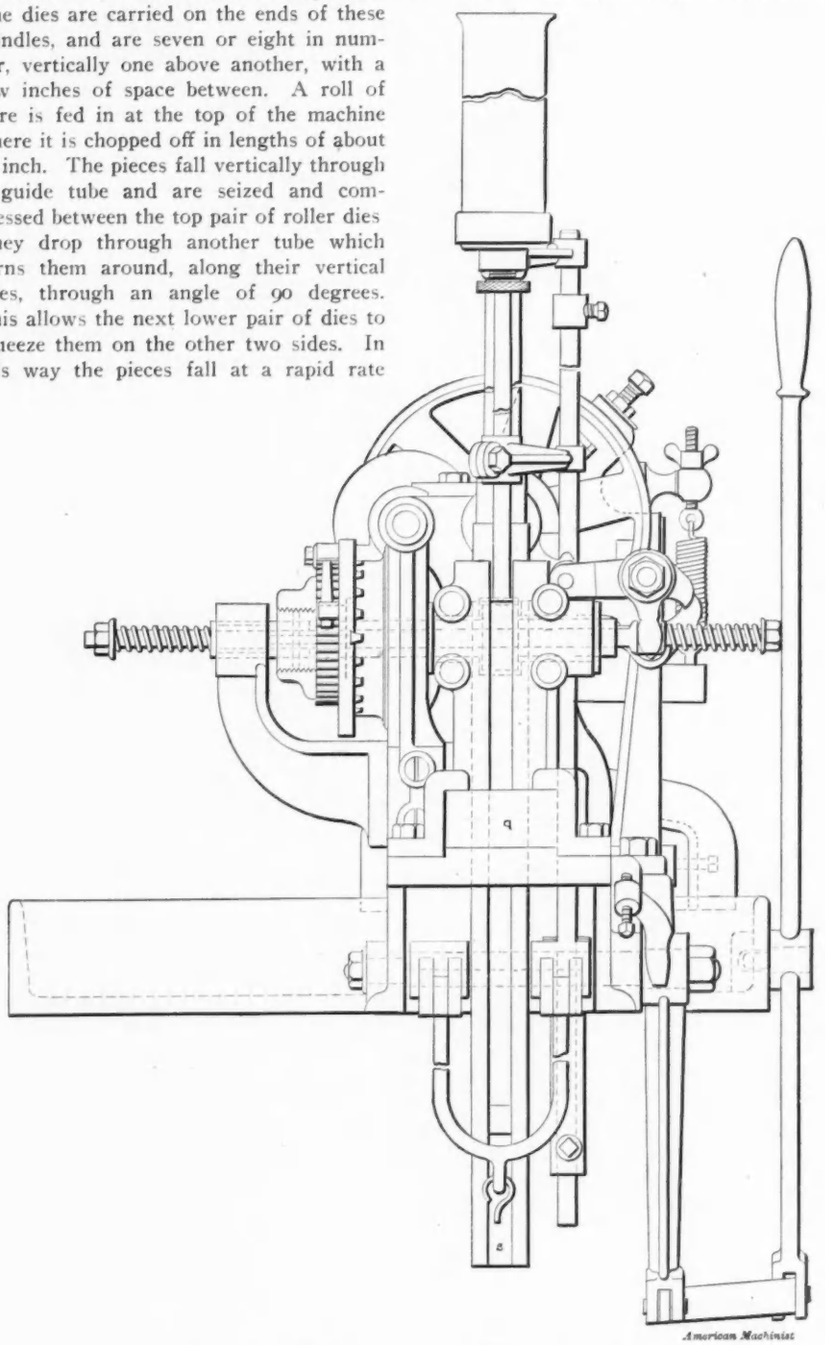


FIG. 9. END ELEVATION OF LAG-SCREW MACHINE.

the sprinkling form of machine be employed; and this carries the elements of non-success in the fact that the draft winnows out the dust from the flying coal and chokes up the flues as well as causing a public nuisance by the dust issuing from the chimney top. This renders necessary the coking form of stoker, in which the coal is fed at the front of the bars and travelled along the bars by the movement of these in various well-known ways. But the coal burns away as it travels, and by the time the back of the furnace is reached there is a large excess of cold air flowing through the half-bare grate. Boilers of the form mostly used in England have internal furnaces, and there is no help for it but that the grates must be practically horizontal. In an externally fired boiler, however, with any amount of available space below the boiler, the grate surface may be inclined as steeply as necessary, and the bar movement, aided by gravity, will feed the fuel forward or downward, and maintain a proper thickness of fuel upon all parts of the grate. Taking into account the necessities of stoking and the chemistry of the operation, I cannot at the moment see how mechanical stoking can be successfully performed unless the aid of gravity be sought in some such manner as I described, for it is not practicable to employ a mechanical means of pushing the coal forward on the grate to fill the voids made by burning.

The specific gravity of gems is much greater than that of ordinary pebbles, and this points to a means of separating gems by agitation in water, an operation that would obviously be facilitated by first grading the mass into a few approximately equal sizes, in order that gravity effects might be better able to differentiate the pieces of different specific gravity.

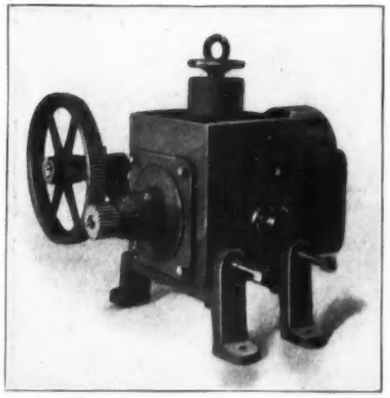
In starting out to improve upon existing machines and operations, it is well to know what has been done before, and then it remains to consider whether the operation can be facilitated by alteration of the plane in which work is done. In nailmaking, coal screening, typesetting and retort working we have examples of the great effects of changing the plane of operation, so as to gain the assistance of natural laws rather than continuing efforts to overcome them. As an example of how the previous way of doing things will hold men's minds, it is said that many of the early engines of Boulton and Watt were employed to pump water upon water wheels, these latter being recognized means of doing work. It required time to set the engine turning the wheel direct. More modern instances of the thraldom of past events are seen in the belted dynamo—though we have engines to run faster than the quickest dynamo—and the automobile vehicle, which still bears the mark of the beast upon it and, except in light vehicles, bears very little evidence of design or intelligence. I see heavy vans running about London which are a disgrace to the intelligence of their makers. Evidently of great weight, with machinery of considerable power, they are horseless vans with added disadvantages. In the first place, they are heavier than a horse-drawn van, and, in the second place, there is no horse in front to push aside an unfortunate pedestrian. If a man is knocked down by a horse he has both time and space to roll aside from the wheels, if, indeed, the horse does not push him safely away. If knocked down by an automobile van, one is under the wheels from that moment, and no designer has yet come under my notice with sufficient intelligence to grasp this salient fact and provide against it by any sort of wheel-guard; while government departments, which demand the paving of an electric train track because it was necessary to pave such tracks when the motive power ran on hoofs, take no heed to the extreme danger of unguarded heavily laden wheels. We look for incompetence in a government department, and we are never disappointed, especially if the department is composed of old women and calls itself a War Office, but we have some right to look for ordinary intelligence in a motor-car designer.

London.

Adjustable Speed Electric Motor.

The accompanying half-tone illustrates an electric motor having a new method of adjusting the speed.

The regular method of making this adjustment in such motors as are used to drive most machinery, in which the speed once set is intended to be permanent without regard to variation of load, is by changing the magnetization of the field through an adjustable rheostat in the field circuit. In this motor the effective strength of the field magnets is varied in order to change the speed, but by removing or replacing a portion of the magnet core.



ADJUSTABLE SPEED ELECTRIC MOTOR.

The magnet core is in two pieces, the inner piece being cylindrical and fitting a bored hole in the outer piece. By drawing out or pushing in this central portion, lines of force passing through the armatures are reduced or increased, the result being a corresponding variation of speed. It will be seen that the cost and complication of the rheostat are saved, and, moreover, the speed may be made to vary in the most minute degree, instead of by defined increments corresponding to the different contact points of the rheostat.

The machines are wound for 110, 220 and 500 volt circuits, and by the device described the speed may be increased 50 per cent. The makers are the Stow Manufacturing Company, of Binghamton, N. Y. The motors were originally designed for use with the Stow flexible shaft and portable drilling outfit, and when furnished for this service they are mounted on wheels and have a suitable reel for holding the insulated wire.

Lectures in New York Under the Auspices of the Board of Education.

A series of lectures on scientific topics of especial interest to artisans are being given in the Board of Education Course of Free Lectures at the following places: At St. Bartholomew's Lyceum Hall, No. 205 East Forty-second street, Prof. E. R. Von Nardroff will give a course of lectures on "Heat as a Mode of Motion" on successive Saturday evenings. The same course is being given by Prof. Von Nardroff on Wednesday evenings at the Young Men's Christian Association Hall, No. 52 East Twenty-third street. All these lectures will be illustrated by experiments and stereopticon views. At Public School No. 15, No. 728 East Fifth street, a valuable course of lectures on Physics, illustrated by many experiments, is given by Mr. J. Newton Gray on successive Thursdays. A course of two lectures on "Sound," illustrated by the phonograph and the telephone, will be given by Mr. Th. I. Jones at Public School No. 64, No. 2436 Webster avenue, Fordham, on February 1, and at Public School No. 61, Third avenue, between One Hundred and Sixty-ninth and One Hundred and Seventieth streets, on January 26 and February 2. A lecture on "The Horseless City, or the Age of the Automobile," will be delivered by Mr. Max Lowenthal at Public School No. 5 on February 5, and at Public School No. 64 on February 8. W. J. Clarke will lecture on "The Wonders of Modern Science" at Public School No. 61 on February 9, and at Public School No. 64 on February 15. Mr. F. W. Skinner will deliver a lecture on "Bridges" at Public School No. 5 on February 12 and at Public School No. 64 on February 22. These lectures begin promptly at 8 P. M.

They are joking the management of the Buffalo Pan-American Exposition on having referred to Niagara Falls as a supplementary attraction.

The Plant of the Norton Emery Wheel Company.

All of our readers are acquainted with emery wheels, and most of them know the Norton wheel. A recent visit to the Norton works, at Worcester, Mass., proved so interesting that we have thought an account of some of the things to be seen there might be of interest to our readers, and the photographs from which the accompanying half-tones have been made were taken for that purpose.

One of the fundamental points of emery wheel making relates to the bond employed to bind the grains of emery together, and to give form and strength to the wheel. A great variety of materials have been and are employed for this purpose, but the one employed in the processes of manufacture here illustrated is vitreous potters' clay. This clay is mixed with the emery in suitable proportions, then molded into proper shape, and finally vitrified in a kiln. The resulting wheel is essentially an unglazed piece of pottery impregnated with emery grains. The wheels are, of course, made in a great variety of sizes and of many grades of hardness and fineness, to suit different classes of work, but in spite of

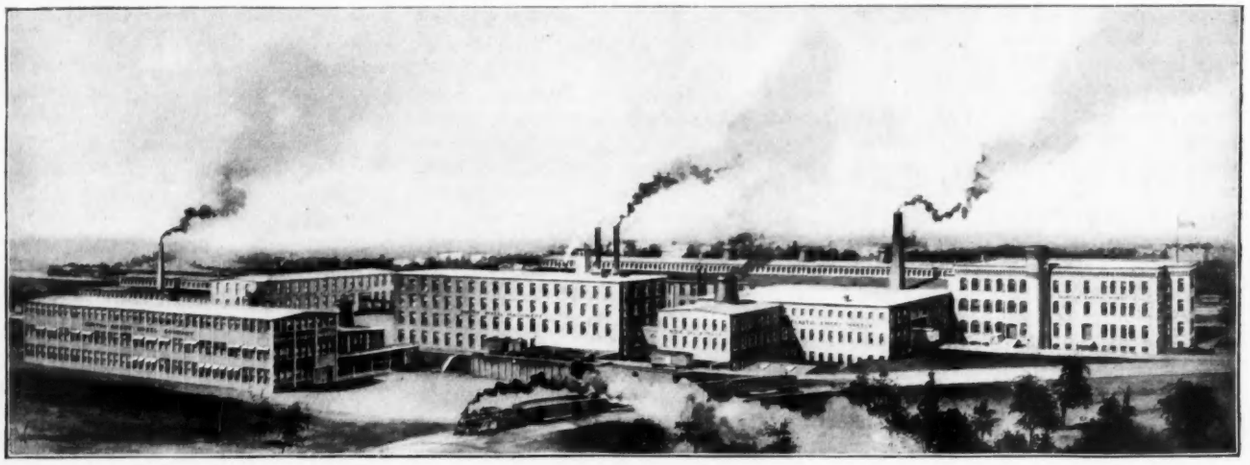


FIG. I. GENERAL VIEW OF THE NORTON EMERY WHEEL WORKS.

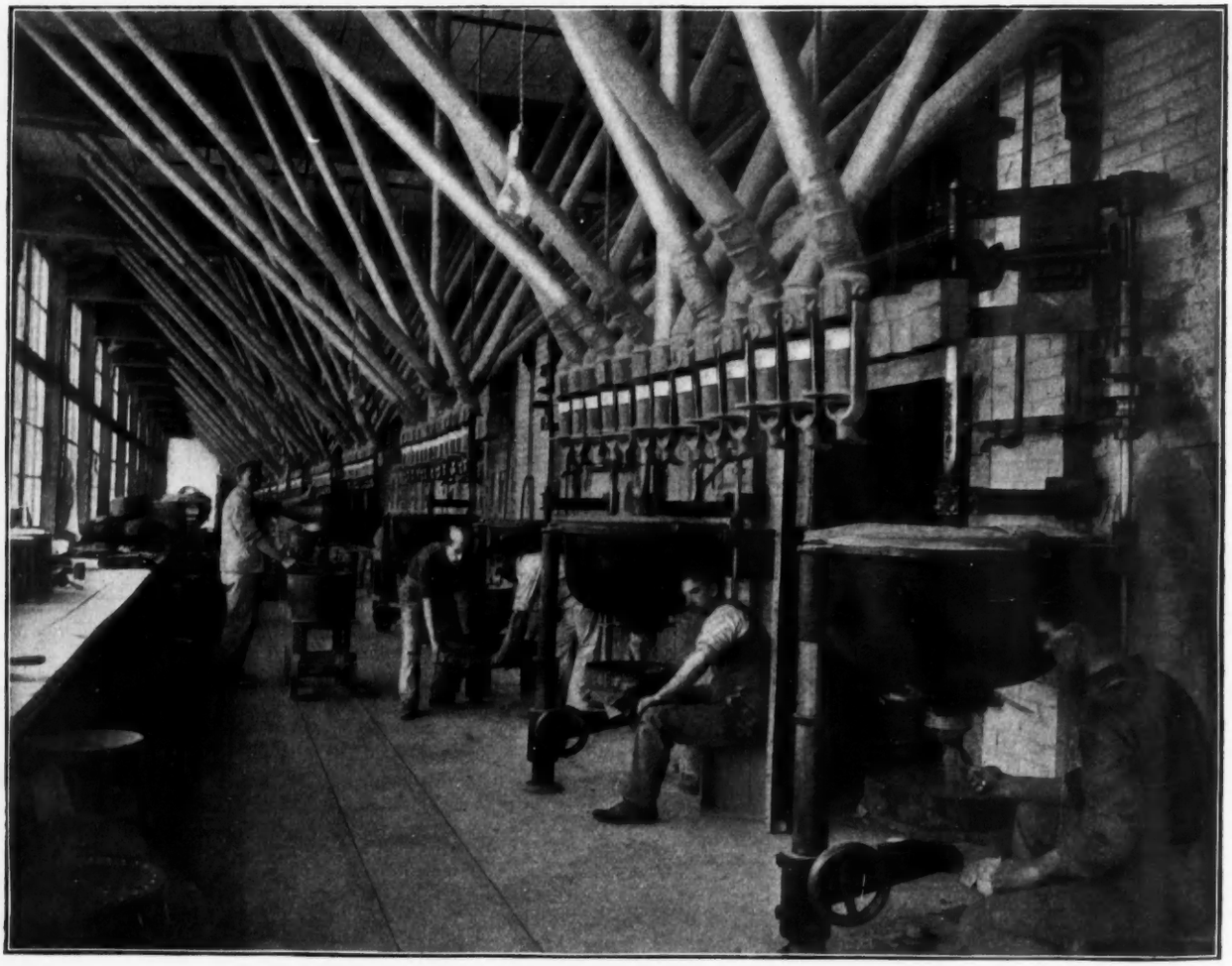


FIG. 2. MIXING ROOM.

these varieties there are still demands for other kinds of wheels for certain kinds of work. Among them is work requiring a large but thin wheel of little strength sidewise, and for these the "elastic" wheel is made by an entirely different process. These wheels, however, form but a small percentage of the Norton Company's output, and when a Norton wheel is bought without qualification it is a vitrified wheel which the purchaser gets.

Fig. 1 gives an excellent outside view of the works, which are located in the angle of a V between the Fitchburg and the Boston & Maine railroads. Spur tracks enter the buildings, and both outgoing and incoming freight is handled under cover. Emery, coal and clay are unloaded directly over bins without extra handling. Passenger trains stop near the works, and express matter is also very conveniently handled. In the background of the picture the works of the Plunger Elevator Company will be seen.

Nearly all of the emery arrives at the factory properly ground and assorted as to size and hardness. A small plant for doing this work is included in the factory, but only a small portion of the material goes through it. The emery is stored in bins holding one ton each and having suitable spouts leading from their bottoms to the mixing machines. One of the mixing rooms is shown in Fig. 2. The emery is drawn into the kettles, and with the proper proportion of clay and water is thoroughly mixed by mechanically operated stirrers. The consistency of the mixture is such that it will flow freely, and after a suitable amount of stirring it is drawn off by a gate at the bottom of the hopper into tin molds. This operation is clearly shown in the picture. From this room the loaded molds are taken to heated drying-rooms alongside, where they are placed upon racks and allowed to remain until the surplus water is evaporated. The wheels are now of such a consistency as to retain their form, and they are taken to the shaving room and placed upon a machine, shown in Fig. 3, which is essentially a potters' wheel operated by power. The revolving table is placed within a bin to catch the shavings, and the wheel is soon trued to size and shape by tools supported from above and guided partly mechanically and partly by hand, as shown in the picture. The size is determined by laying an iron plate of the proper diameter upon the wheel and then shaving the wheel down to it. The wheels are secured to the revolving plate by their weight only, and the speed is such that if placed slightly eccentric the wheel would be thrown off bodily, and it is interesting to note the skill with which the wheels are placed in position. Fig. 4 shows a very large wheel being placed on the shaving machine.

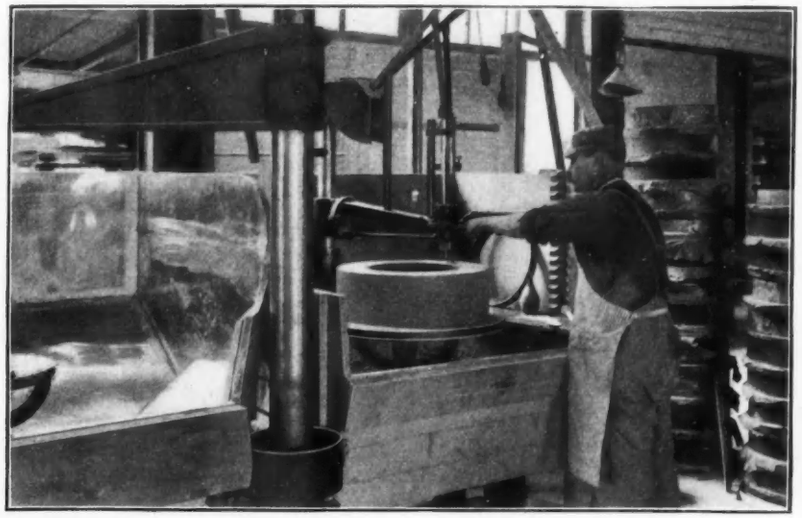


FIG. 3. SHAVING MACHINE.

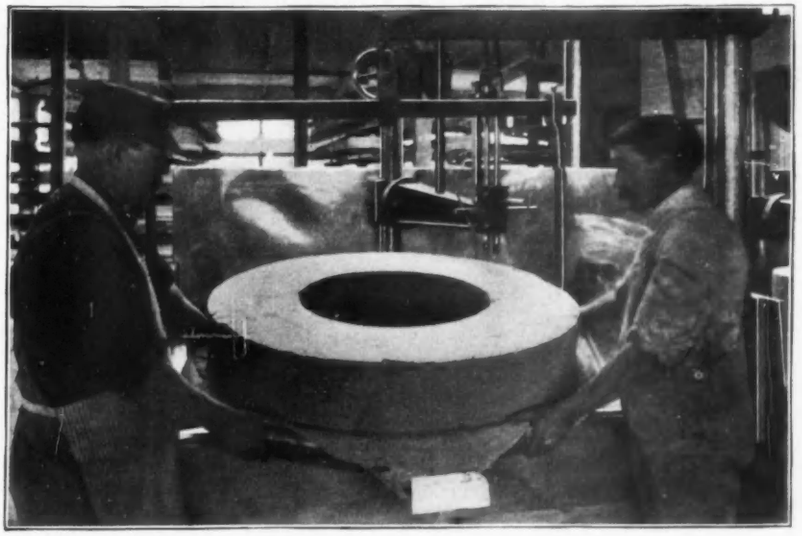


FIG. 4. SHAVING A LARGE WHEEL.

The wheels are now ready for baking, and are transferred to the kilns, where they are packed in retorts made of fire clay, all interstices being filled with quartz sand, and the cover being luted on. The interior of a kiln is shown in Fig. 5, from which it will be seen that they are large structures. They are similar to potters' kilns, but with important improvements made by the Norton Company, whereby uniform heating is secured throughout the kiln. Formerly this was not obtained, and the grade of hardness was regulated by locating the wheels in such a part of the kiln as experience had showed to give the required heat. This unsatisfactory procedure is no longer followed, the hardness being determined by the firing. The firing is done in furnaces below the floor shown, the doors of which open around the base, and the heat passes into the upper chamber through suitable flues and out through the stack above. The company has in all ten kilns, of which the largest are 18 feet in interior diameter. Others are of 12 feet, and two small ones are of 6 feet. While the large ones are the most economical, the small ones are advantageous and even necessary for quickly filling orders for special wheels and for experimental work. A large kiln contains, when full, wheels of a net value of five to six thousand dollars. The firing consumes 20 tons of coal and five to six days of time, and the cooling off about ten days more. The contents of the kiln are heated to a glowing white heat, and when cooling down begins the furnace and ash pit doors are thoroughly sealed at all joints with wet clay to prevent ingress of air and too rapid cooling.

After the baking process the wheels go to the truing room shown in Fig. 6. The truing is done on special machines of several patterns, of which the latest is shown in the middle foreground with a workman behind it. The wheel is carried in a revolving ring with suitable chucking arrangements which grip it by its edge, and a slide rest upon each side faces off both sides at once. The lead hole is also bored

true at this operation, and when next placed upon a mandrel and the edge trued, the wheel is true all over and complete. For small fine wheels diamond tools are used in this work, but for large ones the well-known revolving emery wheel dressing tools of various patterns are employed. This work is dusty, but is said not to be detrimental to health, nor is the far more dusty work in the grinding mill. Large amounts of crushed quartz are used in packing the wheels for baking, which fact makes the company familiar with the effects of both emery and quartz dust on the health of the workmen, and it is a remarkable fact that while work in a quartz mill is seriously detrimental, that in an emery mill seems to have no bad effect, and this in spite of the fact that so far as observation would indicate, one ought to be as bad as the other.

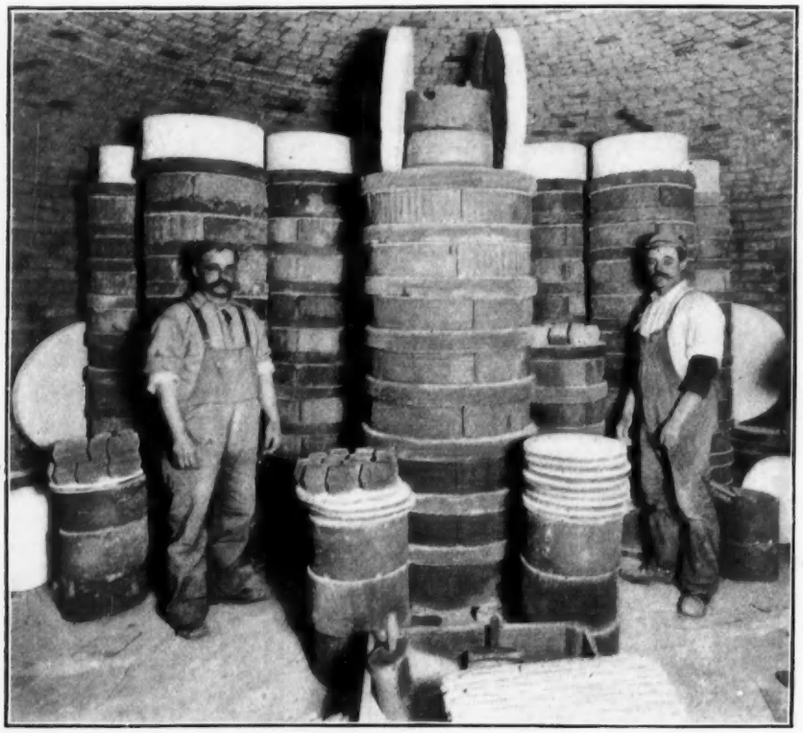


FIG. 5. INTERIOR OF KILN IN PROCESS OF PACKING.

The wheel finished, nothing remains but the testing, and of their testing system and methods the Norton Company are justly proud. Each wheel is mounted on a testing machine speeded to twice the running speed of the wheel. The smaller size of testing machine is shown in Fig. 7. The wheels will be seen to be surrounded by a stout iron case, so that no harm may come in case it lets go. Spindles for running two wheels upon each side are shown, and the counterbalanced cover for the open side of the case will be seen to be so mounted that one wheel may be placed in position while another is undergoing test. A testing machine for large wheels is shown in Fig. 8. After testing, a record of each wheel is entered on the form shown, much abbreviated vertically, in Fig. 9. As indicated at the bottom of this form, the operator each morning takes it before a justice of the peace and makes

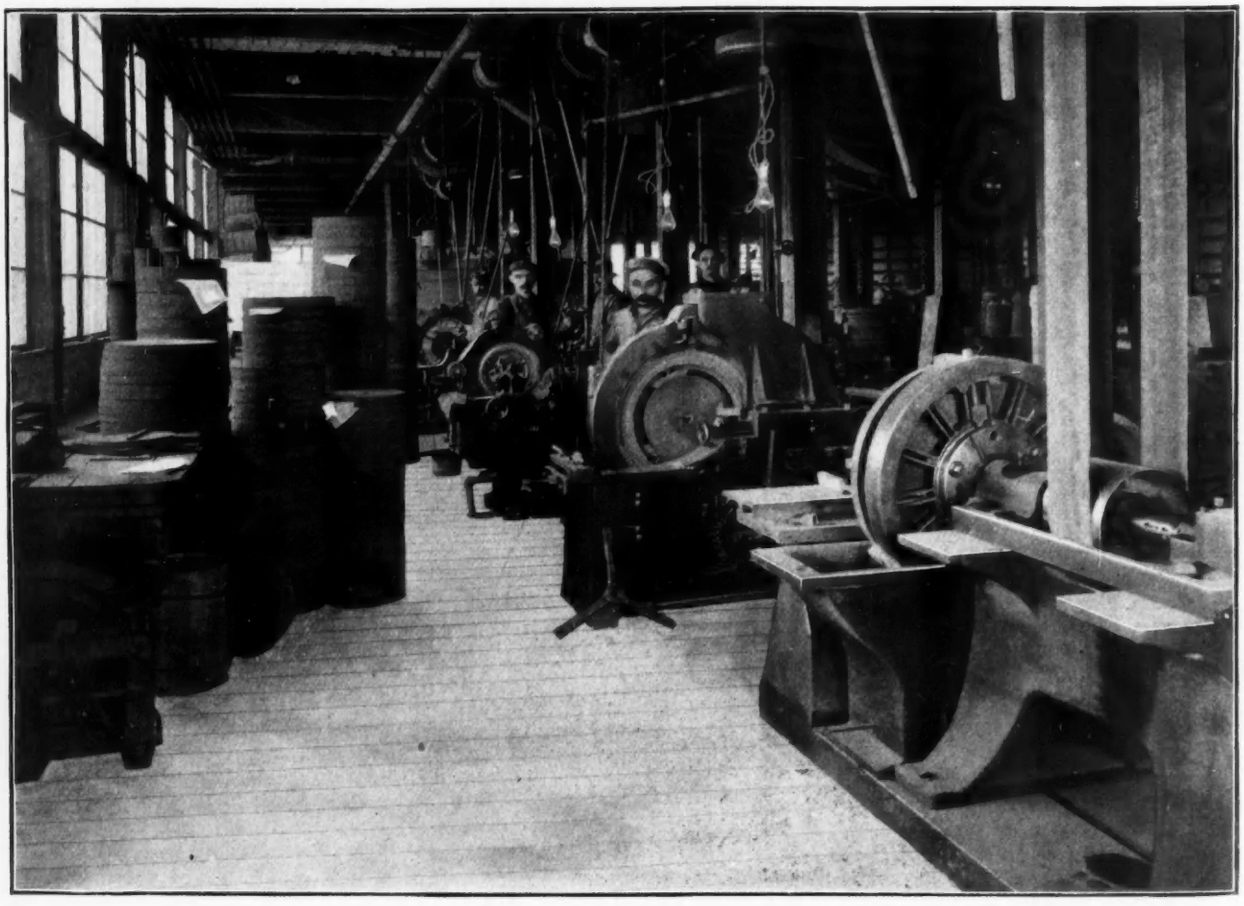


FIG. 6. TRUING ROOM.

oath that the wheels recorded have been so tested by him. These records are filed, and through them and the label attached to each wheel the record of any wheel may be traced. Should a wheel burst in any part of the world, sworn testimony that it has been tested can be produced, and the company be thus shown to have done its full duty in the matter—a kind of "casting an anchor to the windward" that cannot be criticised.

FIG. 7. SMALL TESTING MACHINE.

Fig. 10 shows the shipping room. At the right is an elevator which has just brought up a load of wheels from below, and at the left, in the background, is an elevator with two barrels of wheels which have been elevated to a convenient hight for delivery to the freight cars outside. The arrangements of this room are very convenient, a packing bench being provided with a spout for delivering sawdust for packing direct from an elevated bin.

The convenient arrangement of the works whereby the various operations are performed and the wheels are moved from one workman to the next with a minimum of labor, will be apparent from Fig. 11, which is a plan view of the main floor of one of the newer buildings. It will be understood that the bins for storing the emery are located on the floor above that here shown, and immediately over the mixing kettles.

This business is something over a quarter of a century old, having been originally started in an experimental way by Mr. F. B. Norton in connection with his then pottery business. So recently as 1887 it employed but seventeen men, whereas the total present number of employees exceeds two hundred, and the total floor space occupied exceeds 120,000 square feet, and a new four-story building is now in progress.

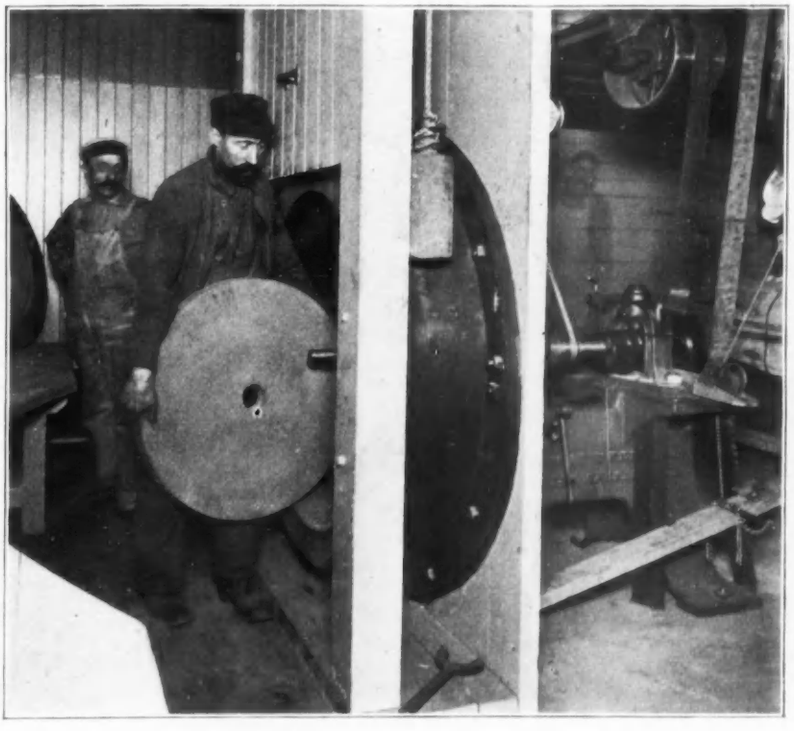


FIG. 8. LARGE TESTING MACHINE.

The variety of wheels necessary to constitute a stock of even one each is far beyond what would be thought possible. In the matter of size alone, they range from ¼ to 36 inches in diameter and from 1-32 to 4 inches in thickness. About 30 degrees of coarseness are recognized and as many degrees of hardness. In addition to this there are many special shapes and several different brands of emery and corundum which are mixed in various proportions for different purposes. A little calculation will show that the number of different wheels possible with these elements combined in various ways runs up into the tens of thousands, and our readers will understand from this why a given wheel is not always found in stock, although about 600 tons of wheels are always on hand. The stock room is in fact the most impressive part of the works, but being filled with racks with only narrow passageways between, no satisfactory photograph of it is possible.

The Automobile Movement—Styles of Vehicles Required—Separate Tractors.

BY M. C. KRARUP.

The automobile movement may be considered as a branch of the general tendency all over the civilized world to substitute machinery and mechanical power for human skill and animal power, and it has been the cause for some wonderment that the United States, being foremost among nations in applying machinery to new uses, has not also been foremost in finding a mechanical substitute for the horse.

If it were fully understood how very many deep and difficult problems are to be solved before automobilism can be a financial success for the great majority of pur-

poses for which horses and vehicles are now employed, the wonderment would cease; for it has been the rule that American invention has aimed to divide labor into simple operations and provided a machine for performing each of these simple operations automatically, but has rarely been first to attack deeply revolutionary problems. The Mergenthaler linotype machine is one of the few exceptions from this rule—and its inventor was a German by birth.

An automobile to be capable of performing all the service that may be obtained from the combination of a horse and any one kind of utility wagon, must perhaps be nearly as complicated as a linotype machine, and its invention calls for as much forethought and simultaneous consideration of a hundred eventualities as was expended on the latter before it became as perfect as it is to-day; and if the conditions are added that the automobile shall be capable of doing its work over all kinds and conditions of roads, and that no more skill must be required of its operator than that which the driver of a horse may worry along with—saying nothing of skilled horsemen, who virtually are few and far between—there is presented a problem so complex that it really requires the most sturdy confidence in the idea of automobilism to tackle it, knowingly. Had all the difficulties been realized from the beginning, it is indeed doubtful if the problem would have been tackled at all in

Report of Wheels Tested ..... 189 .

I, ... *hereby certify that the following wheels have been revolved at the speeds indicated against each item respectively, and have satisfactorily withstood the test, without developing any indication of weakness or other defect.*

Quantity	DIA.	THICK.	HOLE.	MIXT.	MAT.	EMERY	GRADE	Kind of Emery.	Kind of Corundum.	Number of Revolutions per minute	No. Revolutions indicated by Tachometer.	Surface feet per min.	Order No.	FOR

..... *Tester.*

Then personally appeared before me the said ..... this..... day of..... 189 ,
and made oath that the above statement is just and true. to the best of his knowledge and belief.

..... *Justice of the Peace.*

American Machinist

FIG. 9. RECORD AND OATH OF WHEELS TESTED.

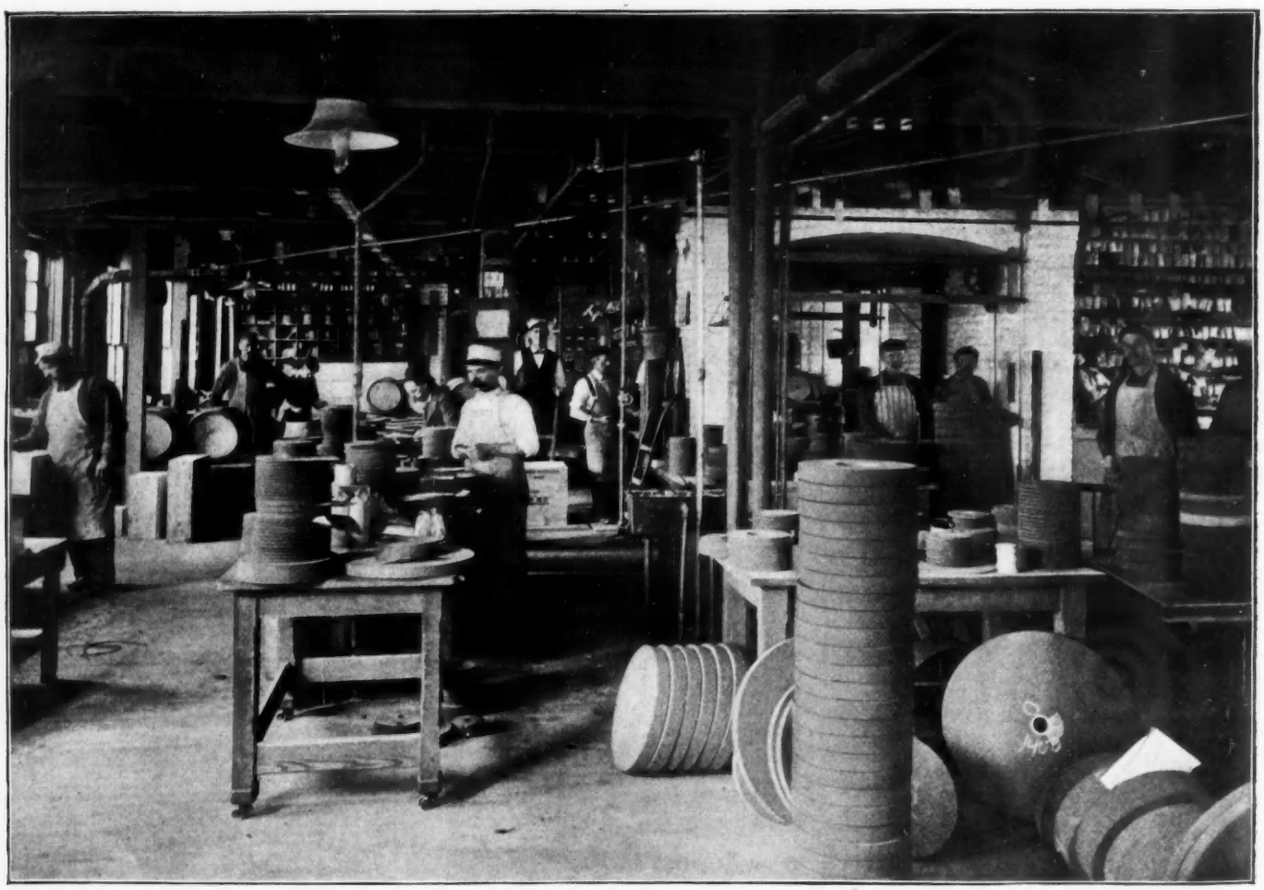


FIG. 10. SHIPPING ROOM.

the United States at the present time, and it still remains doubtful to what extent it will be solved until our road conditions shall have been radically changed.

But the whole movement has been imported bodily, and that accounts, at least in part, for the unusual lightheartedness with which it has been accepted, for our people are naturally prone to suppose that what is possible in a foreign country in the way of invention is also possible here.

As everybody knows, the movement was started in France and in Germany, where the gas motor is at home and where roads and streets are largely smooth, hard and kept in constant good repair. And further, the problem was there simplified immensely by selecting from among the large multitude of applications of automobilism the simplest one of all—that of the small pleasure carriage. In this form of automobile the load is reduced to a minimum, the variety of work is reduced to a minimum, the financial consideration is not paramount, and the necessity for facing any conditions and surmounting any obstacles that may arise, is not urgent.

The pleasure automobile—a vehicle for sport and pastime—was therefore the first form in which it was endeavored to materialize the automobile idea; and in the country presenting the most favorable road conditions it found its first industrial development and market. This development was assisted by three important factors, which are strong in France but weak in United States—(1) high speed, constituting one advantage over horses which is most readily attainable by machinery, is also one of the prime requisites in a sporting vehicle and may be realized on French roads without severe strains on the mechanism, while it is precluded over the average American road; (2) the very imperfections of a sporting vehicle add zest to an amateur driver's enthusiasm if the imperfections are of such nature that they may be overcome by the driver's skill and understanding of the mechanism; (3) the existence of a large class of young men of inherited wealth, unbounded leisure and sufficient technical education to encourage them to potter with an imperfect and expensive luxury if by so doing they may gratify a whim and exhibit at the same time their wealth, their skill and their daring.

On this foundation of favorable external circumstances Benz, of Mannheim; Daimler, of Cannstatt; Levassor, of Paris, and others of lesser note commenced to apply the newly evolved gasoline motor to the solution of one little branch of the automobile problem—the pleasure carriage for smooth, hard roads.

And from the results that have been reached in this little department of automobilism in a foreign country, all the enthusiasm which exists to-day in the United States for automobilism in a much wider sense has germinated. In these meager results it must find its first justification, financially and commercially, in spite of the vast differences in the underlying conditions for successful automobilism in the two countries.

The work which has been done later to evolve suitable freight wagons in France and England, as well as here, forms an after-consideration which had nothing to do with the first acceptance of automobilism as fit for the United States.

It may therefore be said that the whole movement is here from the beginning based on a mistake, in so far as there is no such similarity of conditions in the two countries as to justify the conclusion that automobiles fit to sell and operate there can also be successfully sold and operated here, much less the broader conclusion to which the majority of manufacturers and the public have leaped—that the time is ripe for supplanting horse traction for all sorts of vehicular work.

However, this mistake seems likely to prove one of those fortunate blunders by which men are sometimes thrown into large undertakings which they would have feared to shoulder with eyes open, but for which they afterwards find themselves singularly well fitted. It seems indeed probable that the high perfection to which automatic machinery has been brought in this country and the widely diffused knowledge of its proper use will enable the American automobile industry to turn out motor vehicles at a much lower cost than similar vehicles can be produced for in Europe, and there are some indications that the special difficulties that are created by our bad roads will act as a spur to invention, so that our vehicles, when once acceptable under these severe conditions, will be superior to foreign makes for all conditions, just as dire necessity and undaunted persistency made the agriculturists of Scotland the pacemakers for tillers of more grateful soil in other lands.

But before this may be, the American requirements of automobiles must be gen-

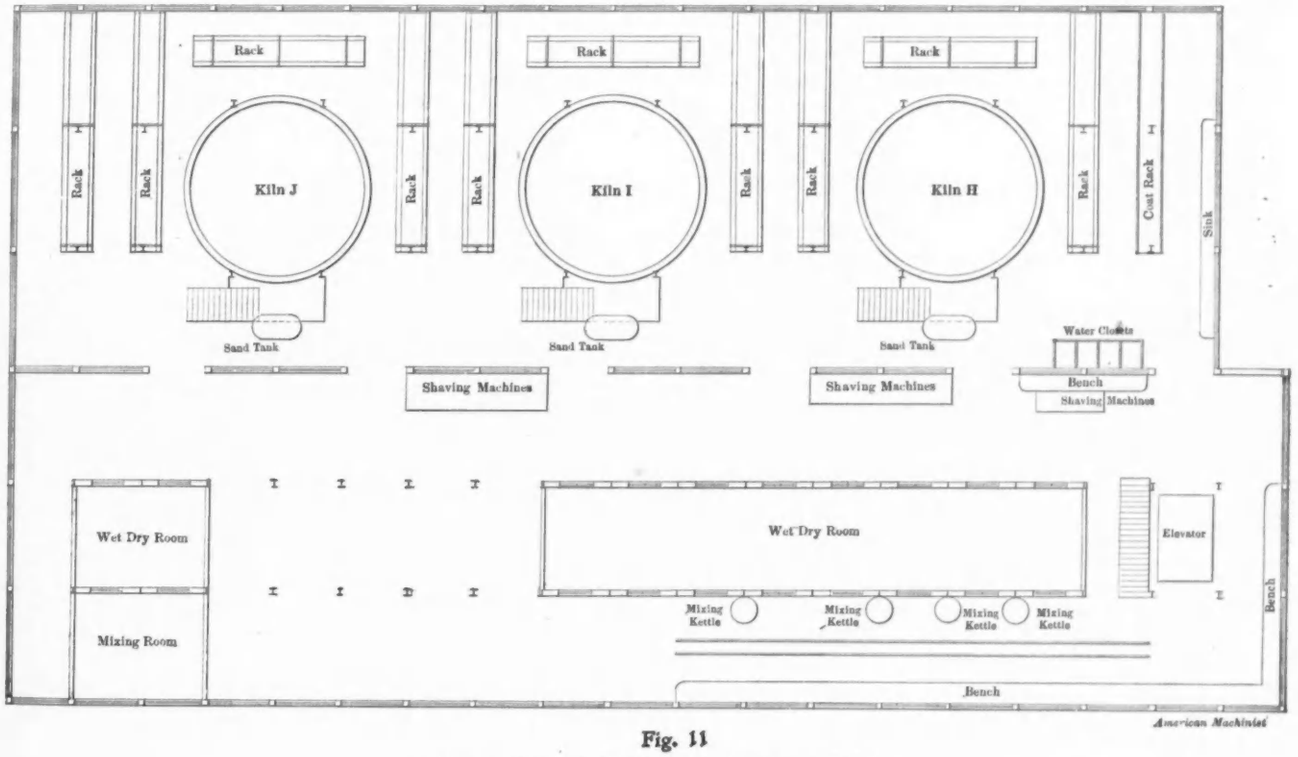


Fig. 11

GENERAL PLAN OF MAIN FLOOR OF ONE BUILDING.

erally recognized, and this has not yet been done.

All that the industry is doing at present is to exploit the misunderstandings which the public share with it. There is not yet a single automobile in the United States which is thoroughly adapted to supplant horse traction, for all classes of users, in any one field—let alone all fields—of vehicle work.

Our special American requirements have reference not only to the bad roads, but also to our social conditions and the character and capabilities of the people who use vehicles.

The absence of a large class of highly educated male idlers with money, the costliness of hired help to do the rough work, and the general utilitarian and matter-of-fact spirit of the well-to-do class, prohibit the general introduction of any vehicle that in unskilled hands will frequently give trouble for which the remedy is not apparent at a glance and ready at hand, or which have no carrying capacity for goods. The same factors in conjunction with the bad roads and the unsightliness of country scenery—exceptions admitted—militate against the adoption of any style of vehicle which is not either all-around useful, like a buggy or spring wagon, or stylish and comfortable enough for exclusive city use. In other words, automobiles as manufactured here now cannot find a permanent market, because they are not useful enough. They are mere locomotion machines, usually for two persons, but not vehicles except in the sense that a tandem is a vehicle. Their advantage over a tandem or two bicycles is extremely problematic so long as there is a chance that the motor mechanism may give trouble. Their goods-carrying capacity is no greater than that of a tandem, as the wagon box is filled with machinery and the space under the seat with repair parts and tools; and in the few American motor vehicles that have the motor and various tanks suspended from the axles, and the wagon box free for use, there are new troubles pertaining to awkward care-taking, greater liability to breakage and a general unsightliness that poorly suits the taste of American vehicle users.

The drawbacks attaching to the stylish and comfortable electric carriages that are intended almost exclusively for city use are of a different nature, which will form the subject of another article, but it may be said in advance that electric traction—by the storage battery as now known—can never be considered the solution of the automobile problem, because its field is limited, by causes inherent in the properties of lead and rubber, to an infinitesimal part of the work now done by horse traction. If all the work which can possibly be done economically by storage battery traction were actually being done in this fashion now, there would yet be no sensible diminution in the usefulness of the horse. Storage battery traction is practically restricted to road conditions that approach steel rails in smoothness and hardness, and in addition is most severely handicapped by grades and load, both of which factors may easily reduce the traveling radius of an electric wagon to such a narrow margin that there is very little left of automobilism in the contrivance.

The realization of the automobile idea by any claimant for high automobile honors must ever be measured by the completeness with which the horse is supplanted through it.

Automobilism is inseparably identified with such new means of mechanical locomotion by which any and all kinds of ground over which a horse is now required to pull a load may be negotiated; and in so far as it falls short of that in any and each of its applications to practice it falls short of that to which the world is looking forward.

This leads to the definition of the automobile, although it may be confessed that things frequently get along swimmingly on very bad definitions. A "vehicle driven by its own power" has been one of the slipshod forms in which the idea has been expressed; a "mechanically driven vehicle" has been another; and people with pride in their logic have made it a point to assert that "of course, the locomotive was really the first automobile," imagining themselves unusually correct. According to this notion a steam roller is also an automobile, and a self-propelled threshing machine is certainly one. Pretentious automobile *litterateurs* have even gone so far as to designate as automobiles the wheeled juggernaut machines that in olden times were rolled down the outer slopes of fortified places with view to mowing down a besieging enemy; yet those innocent affairs were actuated by gravity only.

Definition of this order is profitless and puerile, as it simply effaces that meaning of the word for the expression of which the word was formed. In reality the word stands for something unknown, and to define the unknown is futile. While the automobiles of to-day are mostly self-contained vehicles, there is yet no lack of "motor wheels" and tractors which may be hitched to a vehicle as a horse is hitched, and the combination of a tractor with a vehicle is undoubtedly by all considered as one form of automobilism, although neither the tractor alone nor the vehicle alone can properly be classified as an automobile. An ever increasing number of engineers look forward to some modified form of the tractor as likely to become the most generally accepted expedient for supplanting the horse, and point to strong mechanical reasons for this belief; and this view gains force through the economy that arises from using one tractor for several vehicles, interchangeably, and the rapidity in financial organization and in manufacture which is made possible when practically all the carriage work may be done in the large establishments where old style vehicles are now being made. Thus the automobile of to-morrow may be a combination of a motor or tractor and a vehicle, while the automobile of to-day is a full-fledged self-propelled vehicle—a sort of infant prodigy, overgrown and without the necessary stamina to endure the tests of life and the give-and-take of commercialism; or, the combination system may be preferred for certain classes of work or in localities where roads are rough, and the self-contained vehicle for other purposes or where the roads are smooth and hard. A definition that anticipates results by classifying the automobile as a vehicle is therefore premature, and detracts from the correct understanding of the automobile situation.

The central idea in automobilism has three elements: (1) the supplanting of animal power for (2) transportation purposes (3) on common roads. Any contrivance in which all of these elements are realized is an automobile, and any contrivance which fails to include all of them is something else, and is better designated by some other word. Even so, the word automobile remains a generic term which means little in a practical way, because it is too indefinite; and its usefulness will be exhausted as soon as each of the coming styles in automobiles shall have made a name for itself.

That the number of styles will be very large and will eventually exceed in variety the hundreds of styles of horse-drawn vehicles now in use is almost a foregone conclusion if the ultimate success of automobilism is taken for granted. This may be clearly seen by going back to the central idea above referred to and considering its elements. The animal power that is now used for traction purposes varies in strength and fleetness, ranging from the dog of the Eskimo, the little Shetland pony, the broncho and the mustang, to the mule, the carriage horse and trotting stock, the Percheron draft horse, the donkey, the camel and the Indian elephant; and each of these varieties of animal power—besides numerous others left unmentioned—has its peculiar fitness for some form of transportation work over common roads or virgin ground. Similarly the transportation purposes vary infinitely, and the quality of roads varies infinitely as well. Therefore, if the automobile were to be a self-contained vehicle it must evidently be made in innumerable different styles, each corresponding in usefulness to one of the innumerable combinations of animal power and vehicle that it is now found expedient to use in order to obtain the best performance of transportation work over common roads. By separating the motor part from the vehicle part there is, on the other hand, a chance for reducing this impractically large number of styles, and herein lies another indication that the American adoption of the self-contained automobile in imitation of the French may be super-

seded in the future through the more flexible system involving independent tractors. But so far no suitable tractors have been manufactured, either here or in Europe.

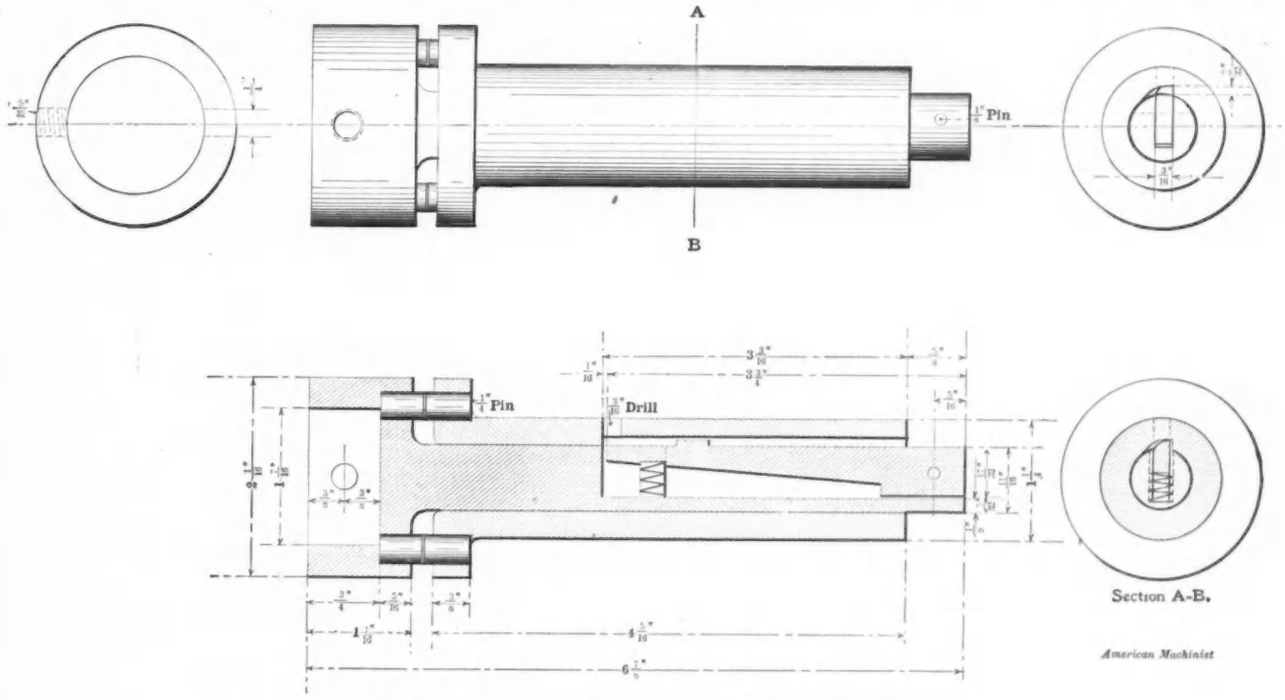
Letters from Practical Men

An Improved Die Holder for the Automatic.

Editor American Machinist:

This is a drawing of a die holder which is a departure from the usual style and has some good features.

Instead of the usual spiral cut on the rear end of the shell to catch a pin in the spindle when the die is run off the work, the shell is splined as shown in the drawing and a latch inserted in the spindle, with a spiral spring under it to hold it up to its work.



AN IMPROVED DIE HOLDER FOR THE AUTOMATIC SCREW MACHINE.

Threads are often stripped on automatic machines by the extreme point of the spiral in the usual form of holder, becoming worn until the pin catches there and does not allow the lateral play of the spindle which compensates for the difference between pitch of cam and lead of screw.

The latch holder overcomes this trouble and allows greater endwise movement to the die, thus requiring less adjusting of the die cam for different lengths and pitches of screws.

The die and spindle can be removed from the machine without moving the shell, and returned to proper place without adjusting, which is a very good feature in setting up a job.

"AUTOMATIC."

Sandless Pig Iron — Problems of Hardware Manufacturers.

Editor American Machinist:

I regret that Mr. West, in his article on "Sandless Pig Iron," did not include, with those mentioned, the experience of some hardware manufacturers, if he had knowledge of any such, who have made tests of this iron.

Their work is of the very lightest character, and must be exceedingly soft; so that a trial by them would indisputably demonstrate the quality of softness.

Few, if any, of the list given could make this light work and insure its being soft. Some might be able to turn out light castings in the generally accepted term, but scarcely one could make a ring 4 inches outside diameter, 3¼ inches inside diameter, ⅛ inch thick, having inwardly projecting arms with points soft enough to be readily drilled.

This, I think, would be considered a good test for softness of sandless, or any, pig iron, and I doubt if any foundryman making these castings would venture to use chilled plow castings in them.

The rings are made from the best and highest price pig, and it was found by experience that not every mixture will give satisfactory results.

A mold of these castings yields 50 per cent. sprue, which is never remelted to go into them, but is tumbled and used in other work, some of which is annealed, to absolutely insure its being soft. The rings cannot be annealed, for it has been found impossible to pack them into the pots so that a large percentage will not twist out of shape, and they expand so they will not fit the jigs.

I understand that one of the largest machine manufacturers buys its iron with regard to strength of its large castings and anneals its light work.

In over forty years' experience we never found but one iron that would not chill. This was two years ago, when making plow castings, which came out soft regardless of the usual chills being used. This business was since abandoned on account of the havoc made in the other work.

There was a time when a certain amount of stove scrap could be safely used in light castings, but stove manufacturers are evidently not using the iron that they did, judging from the unsatisfactory results obtained from the use of their scrap.

While the hardware manufacturers may not be the "whole thing," still they form an important factor in the pig iron consumption, and what will answer their purpose will do for small machine parts.

C. F. F.

Some New Decisions Regarding Patents.

Editor American Machinist:

It seems to me that the decision of the district court in the case of Bechman vs. Wood, reported in the "Patent Office Gazette" of December 19, is of very great interest to readers of the "American Machinist," who are usually interested in the patent question as a measure of protection. Carried to its logical conclusions, it seems as though the decision will become of far-reaching effect. If A cannot enlarge the scope of his claim after B has filed an application, not because he is not

the first inventor, but because B has in the meantime invented a substitute, or infringement, and has a right thereto, will not the next court decide as rightly that after C has made an invention, but takes the supposed two years' privilege of perfecting it, and at the end of a year D, seeing C's invention, perfects a substitute, C will be equally and as effectually debarred from making a generic claim as Wood is in this case. In other words, is not the status of a patent during perfection, or the two years allowed public use, just the same as though the application was filed and was pending in the office, and that after C comes into the field with the same generic invention as D has made, D is therefore barred from claiming the same scope in his patent that he was before C's rights intervened? The "American Machinist" has several times recommended its readers to give their inventions a practical market test before applying for a patent, but it seems as though this plan must be abandoned if the test of the award of a patent in an interference case is not the priority of invention, but priority of *both claim and invention.*

It has, I believe, been generally understood that the first inventor could come into the Patent Office even after a second inventor had secured a patent, and secure a patent covering his invention as broadly as he could have done originally; but by this decision will not every inventor be obliged, if he desires more than limited *detail* claims, to forego the two years' test of his invention?

The decision of the United States Supreme Court in Chicago & Northwestern Railroad Company vs. Sayles, that even after filing a patent, amendments increasing its scope, if other inventions have been made which the increase would cover, are valueless, will be news to many inventors. Two men in any walk of life cannot of their own free will describe the same occurrence or object in the same words; no more can be expected of patent attorneys, and it has been usual to allow the inventors to rearrange their claims in interference cases so that the contestants will use the same language. Under this decision of the United States Supreme Court, if the actual prior inventor enlarges the wording of his claim to meet the junior party, is not his patent actually invalidated thereby?

I write this from the layman's point of view, and to you because the decisions seem to indicate the contrary procedure in applying for patents to that you have frequently recommended.

GEORGE L. ROBY.

Dayton, Ohio.

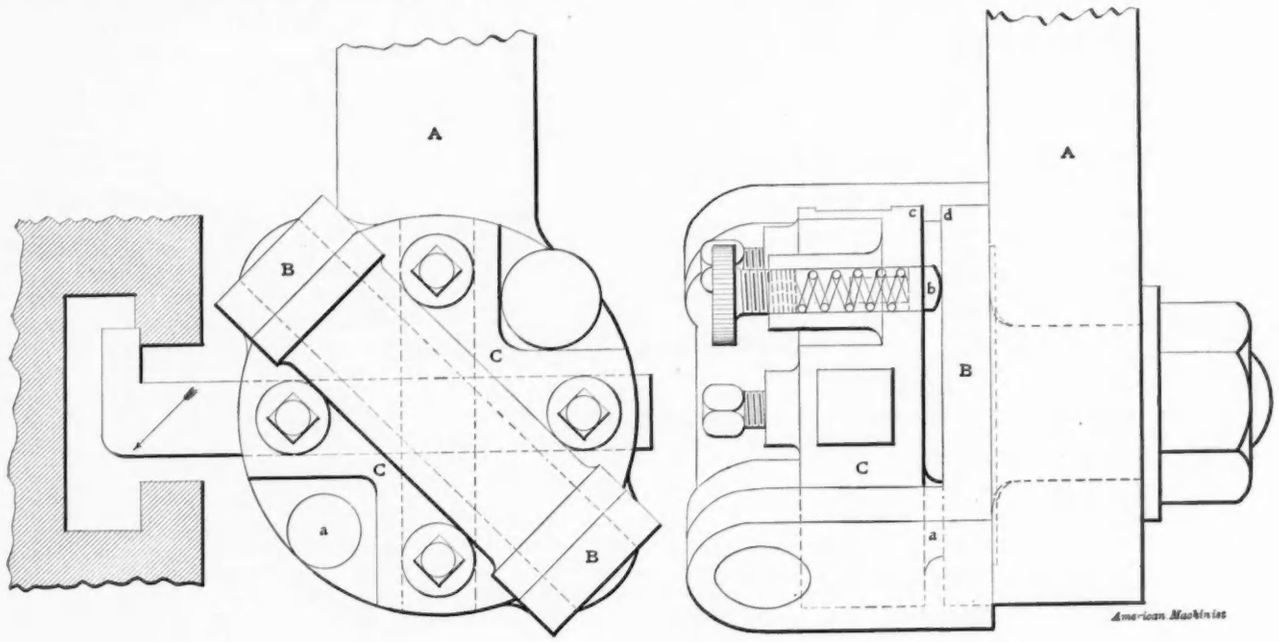


Fig. 1

TOOL HOLDER FOR THE PLANER WITH CLEARANCE SWING IN ANY DIRECTION.

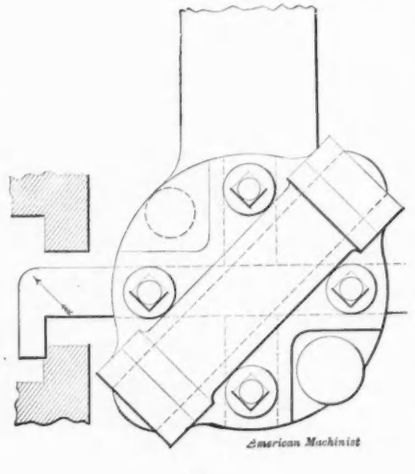


Fig. 2

THE CLEARANCE REVERSED.

Clearing the Planer Tool on the Back Stroke.

Editor American Machinist:

I notice that Mr. Tecumseh Swift, in his latest effusion, "Some Items of Circumstantial Evidence," tells of having recently seen a planer platen set up on the back edge for planing the T-slot in the front edge, and he decides at once that it was not the quickest or cheapest way to do it. Now, I usually have a little hesitation about too hastily condemning any practice that I see prevailing in any shop to whose ways I am a stranger, and especially where they have had years of experience to tell them what is best. There are usually considerations of considerable weight to be urged in defense of any established practice. The considerations that have done service for years are apt, however, to need revision after a while.

I can easily understand that according to old-time planer practice it is not a very comfortable job to plane the T-slot with the platen in the horizontal position. The facing of the inside vertical surface, especially when cutting upward, is not a pleasant thing to do. You can't block the tool rigidly in place and run back without being sure of crumbling off the cutting edge, and there is no way of getting any clearance swing for the tool with the usual tool carrier. The only way seems to be to lift

the tool clear out of the slot, let the platen run under it all the way back and then drop it into position again for each successive cut. This is not only a tedious operation, involving harder work than a poor planer hand is used to, but the platen has to be run back much farther for each stroke than would otherwise be necessary, to make room for dropping the tool, and this added run of course means also added time on the job. In setting the platen on edge and planing the inside surfaces horizontally, the trouble is not all gotten rid of, but it is a little more comfortable.

In this connection I venture to call attention to a tool or a tool-holder that will get rid of all this trouble entirely by providing the tool with a clearance swing for the back stroke, no matter in what direction it may be required. In Fig. 1 it is shown with the tool cutting the upper vertical face inside the T-slot, and swinging away from the cut on the back stroke in the direction indicated by the arrow, thus clearing the tool from both the faces with which it is in contact. The tool may be made to swing in any direction and give clearance on the back stroke from any surface, no matter what its angle. The main piece, or stock, *A* of the tool-holder is fastened securely in the usual manner and blocked so that it will not swing up. The lower end of it has a circular enlargement, the front face of it forming a seat for the piece *B*, which has a round shank fitting a hole in *A*, and a nut at the back by which it is secured. This piece *B* may be turned to any angle desired and secured by the nut. A turned pin passes through the two standards on either side of *B*, and on this pin swings the tool carrier *C*. The permissible swinging movement is only what is required to give the necessary clearance to the tool. It may, if found expedient, be greater than indicated in the sketch. When the tool is cutting, the lug *a* bears against the flat face of *B*, and the thrust of the spring plunger *d* brings it normally to this position. The tension of the spring may be adjusted as required by the screw plug with the round, milled head. The yielding of this spring-actuated plunger allows the tool-holder *C* to swing until the outer corner *c* touches the corner *b* of the piece *B*. The tool may be inserted in either of the two channels provided, and secured by the two set-screws as shown. As the tool-carrying channels are inside or back of the pin upon which *C* swings, when the movement is in the direction to carry *a* away from its bearing surface on *B*, the movement of the tool will be in the direction indicated by the arrow, and the necessary clearance will be provided for the back stroke.

Fig. 2 shows the position of the tool and holder when planing the lower inside vertical face of the T-slot, and it requires no additional explanation.

Now let the stock or shank *A* be turned around and clamped securely in the machine as before, but with the hexagon nut in front and the tool sockets behind, and let a tool suitable for planing horizontally, a diamond point or its equivalent, be inserted and secured in the vertical socket, and with the cutting point projecting a suitable distance below, and facing forward in the proper position for cutting. The swing of the tool then when the planer makes its back stroke would be upward and to the right, as you stand in front and face the planer. The swing would be just what the tool should have when feeding away from the operator. Turning *B*, and *C* with it, 90 degrees, keeping the bearing point *a* still above the center, and inserting a tool in the other socket, which would then be vertical, the swing of the tool for the back stroke would be upward and to the left, or just as required when feeding toward the operator.

It would of course look rather odd to have the tool clamped behind the holder instead of in front of it, but that, as I have always contended, is precisely where the tool should be. It is one of the worst features of the standard planer that the tool is carried so far in advance of the cross-rail. The strain of the cut always causes a springing downward of the tool, and is responsible for the annoying chattering and digging-in of the tool that occurs, especially with heavy cuts or with deep-reaching tools.

This tool is worth something more than a passing glance. With it in use we have no more need of the swinging holder and the tool carrier of the planer, as it has been made from time immemorial. The tool can be brought nearer to the cross-rail and the carrying of the tool behind the holder for horizontal work just puts the finishing touch to the whole thing, so that if the holder is not quite perfect for general planer use, someone will perhaps suggest what more it wants.

MORRIS FULTON.

Philadelphia.

Respecting Workmen's Rights.

Editor American Machinist:

The range of topics which engage the attention and interest of the mechanic as such is necessarily a broad one, and not all of them have to do with the shop manipulations of tools and material. One of the strangest things that has ever compelled me to do some thinking from the standpoint of the American workman is told about in the following paragraph:

"A recent order issued by Charles J. Harrah, president of the Midvale Steel Works, at Nicetown, where 2,300 men are employed, has been the means of swelling the exchequers of many barbers in Nicetown and Germantown. The order, which is being vigorously enforced by Major Lyle, chief of ordnance, requires that every employee in the extensive plant must have his hair cut before his neck begins to be fringed with hair, the latter condition being considered an indication that the offender is lacking in cleanliness and pride in personal appearance. Some young men in the employ of the company ignored this peremptory order of President Harrah, and as a result have taken an enforced vacation. James Quigley, who is styled the chief of police of the works, strolls about the place daily, scanning the necks of the toilers while at work to discover if any of the men need a haircut. 'Get your hair cut!' is a byword among the men employed at Midvale."

The above extract is from the Philadelphia "Record," and it is now two months old. It has been reprinted in other papers, and is of course public property. I have no information from any source that the firm mentioned has sued the "Record" for libel. It does not appear that the man who is said to have issued and enforced the outrageous order has had sufficient regard for his present and future status among men to deny it, and I have not heard that there has been any general strike of the employees. Under the circumstances, as I am here informed of them, the only ones for whom I can retain any respect are the young men who are said to have been bounced.

Undoubtedly a firm has a right to employ whom it will, and it has a right to refuse longer to employ those who do not comply with whatever "rules" it may formulate. It has, and in the abstract should be protected in it, a legal right to gage the length of the hair of its employees; and if it may dictate as to the style and arrangement of the natural covering, it may also say what the artificial integument shall be. It may of course prescribe that its employees shall wear a uniform composed of alternate broad stripes of contrasting colors. But what about the men meanwhile? Their rights may be equally operative. There are various tastes as to the way the hair shall be worn, and many of the men of the works may have chosen heretofore to have their hair short, but now if they have it cut again the human nature will be lacking in their neighbors if they do not hoot after them as the creatures of a despot.

I have before me an interesting picture of the officers of the United States Navy in line and about to call upon the President on New Year's day, and in the front of the line are, side by side, Admiral Dewey and Admiral Melville. I can imagine the line arriving at the White House door and finding there a placard announcing that those with long hair shall not be admitted. The President of the United States would have a legal right to shut out Admiral Melville by such an absurdly unimaginable piece of impudence as that, and then the Chief of the Bureau of Steam Engineering and late President of the American Society of Mechanical Engineers would be no worse off than if he were seeking a job, or, being in, were wishing to retain a job at the Midvale Steel Works. It is not clear to me why

the position that a man may hold should determine whether or not he should submit to a personal insult. The thing, as far as I can see, is unexplainable and inexcusable.

It is simply a piece of bad workmanship. There are differences in skill and workmanship, I suppose, among managers of steel works as well as among those whom they manage. Whoever is the engineer of this thing belongs in the same class, or so it seems to me, with the fellow who breaks the castings in strapping them down on the planer, who spends a lot of time in getting a nicely finished surface on a piece and then puts on some extra touches of dents and scratches, who puts a nicely fitting shaft into a solid cast-iron bearing without wiping it off or oiling it, and gets it "seized." The thing that the butcher workman undertakes to do is generally a proper or even a necessary thing, only he does it in a slaughtering way. Cleanliness, personal or other, has been maintained before this, and it is the habit of the employees of American industrial establishments to present a neat and creditable appearance, but never before, that I ever heard of, through the enforcement of such an outrageous rule as this.

In a force of over 2,000 men it would be strange if there were not some who were not more or less objectionable in their personal habits, and some beyond the point of patient endurance, and they are the individuals to deal with, but it is not expedient to include the 90 per cent., or the 99 per cent., to whom the suggestion of the enforcement of a rule of this character is necessarily a personal insult, whether it is resisted and resented as it should be or not. There have been schoolmasters before now who have threatened to whip the whole school to make sure of punishing a single guilty one, but that kind of discipline has never achieved a phenomenal success.

TECUMSEH SWIFT.

An Outside and Inside Gage—A Tap Guide.

Editor American Machinist:

The matter of fitting pillow blocks and caps together requires gaging very nicely, or there will be a good deal of hand work on the job, and to make a gage for every size ties up money, as well as making a lot of extra tools to look after and keep in repair. In Fig. 1 we have a gage that will measure and take in quite a range of work. *F* is a piece of hydraulic tubing, turned and ground true, for the two heads *a a* to slide on, and each held in position by its set screw *D*, as shown in the end view. These heads are so made that the faces *x x*, for measuring inside of a job, are just in line with faces *y y*, for measuring the outside. So, if we set *x x* to the inside of a pillow block and plane the cap to *y y* they should go together. If we wish to go to the expense, we may have the bar *F* graduated, and by setting the heads *a a* to the scale marks through the opening *B* it will save a good deal of trouble when getting a size. The bar *F* is made of tubing, for lightness. The heads should be of steel and hardened, so that when once ground true they will last for a long time. There are endless lathe jobs for which this tool may be used, where facing inside and out to fit is desired.

Fig. 2 is a great saver in time, when there are cylinders or other like parts to be tapped with a number of holes on the same surface. It consists of an angle bracket *a*, of steel or cast iron, faced on the lower surface to fit flat on the part to be tapped. It is also bored for the hardened steel bushing *B*, for holding the tap perfectly true when entering the drilled hole. After one hole is tapped,

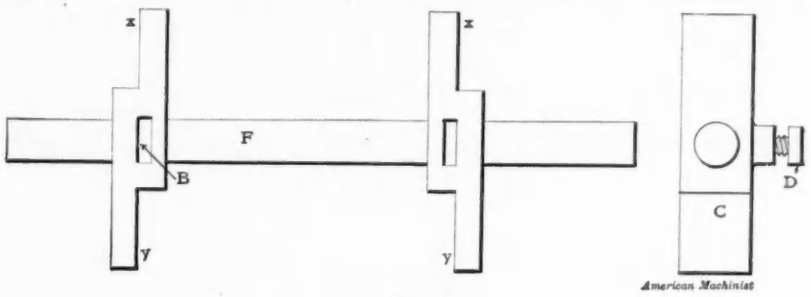


Fig. 1

AN OUTSIDE AND INSIDE GAGE.

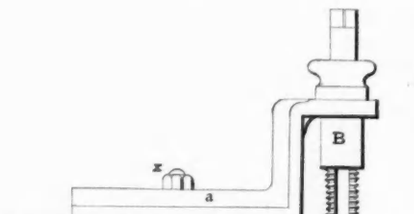


Fig. 2

A TAPPING GUIDE.

the stud or a tap bolt *x* will hold the bracket by screwing it in this first hole and sliding the bracket along until it brings the tap over the next hole, and so on. The lower end of the bushing *B* is bored to fit the thread end of the tap, while the upper end is fitted to the shank. This bush may be removed and other sizes inserted for tapping different sized holes. By the use of this guide there is no square required, and the time of squaring the tap is saved. Another point in its favor is that it taps a better hole, as the tap goes straight down after it starts, where, by the old method of tapping, by the use of a square, the hole is apt to be tapering, from trying to true up the tap after it has once gotten out of square. Then, a boy may be trusted with a job of tapping who has had only a short time in the shop. With a helper, he can do just as many holes in a day as a journeyman, and this is a job the "jour" does not like.

H. S. BROWN.

The Expected Salary.

Editor American Machinist:

I have been much interested in the various articles on "The Salary Expected," as doubtless the rest of your readers have been.

I am greatly interested in my work, but when (as it did once in my experience) the "salary expected" failed to come, I found that my enthusiasm took a sudden drop, and I began to look up a new job.

I well remember my first experience in the salary line. I saw a promising advertisement in the paper, answered the same and waited for the letter that came at last, and I finally went down to see the president of the company, or, as he was and is still called, the "Old Man." We settled all the details of the trade except the salary, and when I told him my price, his countenance lengthened.

"Too high! Too high!"

"All right," I said, as I arose from my chair, "if you want a cheap man you will have no trouble in finding one, the woods are full of them."

"Sit down, Mr. Press; sit down. I don't want a cheap man, but I do want a good one. I think, though, you should come for a hundred dollars less, the first year."

Well, we had it *pro* and *con* for an hour, and finally I started for the depot. The "Old Man" said he was going that way, so he walked down to the station with me. I got my ticket, went in and took my seat, when the "Old Man" came along to the car window and said: "All right, Mr. Press; come so as to start the first of the month."

Well, I went, and I must say it was a good place, and I was used white. (The "Old Man" is dead now.)

I think the advice given by Chordal in his writings on this subject, headed "How to Get Your Pay Raised," is worth more than the price of the book for this information alone; and I earnestly advise any young man who wants to get his wages increased to send for a copy.

A. P. PRESS.

Payment for Inventions Made by Naval Officers.

A bill has been introduced by Senator Hale providing that whenever any officer of the navy shall perfect any invention or discovery during his connection with the naval service, and the same shall be deemed to be of use or benefit to the service by the Secretary of the Navy, he may be permitted to make use of the same to the extent that he may deem desirable without the making of any contract or payment of same to the owner of the patent or invention, the royalties, compensation, etc., to be recovered by the officer in the Court of Claims, which court would be expected to make rules for the trial of such cases, conforming with rules already established by the Supreme Court for the practice in courts of equity, and all claims to be settled within one year, unless further extended at the discretion of the court for sufficient cause. A. F. T.

Legal Notes—An Accident With Tumblers—Assuming the Risk.

While Frank Carlson was employed by the Monitor Iron Works, at Sing Sing, N. Y., in their foundry, he received injuries which resulted in his death. Carlson had been employed for ten years as a molder's helper, was familiar with machinery, and for eight or nine years before the accident occurred he had been engaged in work in connection with the tumbling room, where the accident occurred. In this room there were five tumblers, in a continuous line, into which sprews or pipe castings were placed for cleaning purposes. Each tumbler was about 5 feet in length and 4 in diameter, and was fitted with doors, which, when closed, were fastened with an iron strap and a wooden wedge. The wedge projected an inch or an inch and a half. There were also flanges and rivet heads on the side, projecting an inch or two from the body of the tumblers.

In front of the tumblers, and about 2 or 3 feet distant, was a railroad track, running parallel with the line of the tumblers, and used for trucks upon which the pipe castings were brought to the tumblers. It was part of Carlson's duty to unload the pipes, put them in the tumblers and fasten the doors. On the day of the accident Carlson, while in the act of lifting a pipe from the truck, slipped and stumbled, was thrown against one of the tumblers, which was revolving, was caught in some way and thrown over it and wedged in between it and the shafting in the other side, and thus received the injuries which caused his death. Anna Carlson, as administratrix of the deceased, sued the Monitor Iron Works to recover damages for the alleged negligence which caused Carlson's death. It appeared in the evidence that some two years prior to Carlson's accident, the clothing of other men had been caught on part of the tumbler, and also that the flanges, rivets and wedges were "obvious to anybody's sight." The trial court of New York dismissed the complaint and rendered judgment in favor of the defendant, and an appeal to the Appellate Division affirmed the judgment of the trial court and held that the case was one where Carlson assumed the risks incident to the business, and that by entering upon the service with full knowledge of the facts, waived, under the common-law doctrine of obvious risks, the performance by the master of the duty to furnish special protection required by the Factory Act of 1890 (38 App., Div. 38).

W. Marston Seabury.

New York.

The rapid growth and remarkable popularity of schools of correspondence prove that this new system of education meets a distinct want. Starting about ten years ago with a single course in mining, The International Correspondence Schools of Scranton, Pa., have developed so rapidly that they now teach by mail over seventy courses and have over 130,000 students on their rolls. Most of the students are residents of this country and Canada, but the schools have a large following in foreign lands. Students in twenty of the Mexican States are enrolled in the schools, and almost as many European countries are represented. That no country is too remote to be reached by the correspondence school is shown by the records of students in South Africa, Australia, Tasmania, Siam and Korea, who are educating themselves through the courses of the International Correspondence Schools.

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant ; see p. 16.

Caliper cat. free. E. G. Smith, Columbia, Pa.

Forming lathes. Mer.Mach.T.Co.,Meriden,Ct.

Punches & dies. Wal.M.Wks.,Waltham,Mass.

D'ftsmen's novelties. D.J.Kelsey,N.Haven,Ct.

Rawhide, fibre and hard rubber gears. The Arthur Co. (See page 8.)

We want a 36 in. lathe and a 72 in. radial drill. J. P. Materne Mfg. Co., St. Louis, Mo.

Light and fine mach'y to order ; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies & Diemaking," $1, post paid. J.L.Lucas,Bridgeport,Ct. Send for index sheet.

Wanted—8 or 10 ft. boring mill ; must be in first-class condition. Address Box 127, American Machinist.

Selden Packing for Stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., New York.

Wanted—Good second-hand 20 or 30 in. lathe and small boring mill. Correspond with Northwestern Supply Co., Duluth, Minn.

Any shop prepared to build a small link-motion model in lots of 100 or more should write to Box 140, American Machinist.

For Sale—Two geared Ferracute presses, 62 in. between uprights ; little used, and in good condition. Address W. H. Mullins, Salem, Ohio.

Threads and gears ; easy rules to cut any thread possible to be cut in the lathe, without algebra, sent to any address for 25c. by G. W. Dixon, Spring Lake, Mich.

Mechanical engineer solicits correspondence with capitalists or manufacturing concerns who want to build an improved high-speed engine. Box 110, American Machinist.

Experienced designer wants to join capitalist or manufacturer in bringing out a new kerosene, gasolene or gas engine ; many new and practical features. Box 142, Am. Mach.

Wanted—Partner with capital to start machine shop and foundry ; cheapest fuel in the world ; free site ; good opportunity for broad-gage man to build up lucrative business ; products sure sale. Address Box 141, American Machinist.

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisements under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded ; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Foremanship of iron foundry, by foreman, experienced on engine and general jobbing work. Box 135, American Machinist.

Experienced foreman machinist wants to change ; machine tools, engines or jobbing ; modern methods ; estimating etc. ; can handle men to advantage. Box 153, Amer. Mach.

Mechanical engineer, 15 years' experience selling, designing and office management, pump and engine work, technical trained, open to engagement February 1. Box 109, American Machinist.

As representative of responsible firm on machinists' tools or gas engines ; am thoroughly conversant in all details pertaining to same ; A1 references furnished. Box 151, American Machinist.

Oil and Gas Engines.—Advertiser with long experience, practical, theoretical and commercial, is willing to negotiate with good firm for responsible and permanent position. Address Box 152, American Machinist.

Mechanical engineer, with 18 years' experience in heavy transmission machinery, steam engines, hydraulic engineering, general machinery and structural work, wants position ; references. Address "Technical Graduate," American Machinist.

Toolmaker of ability and long experience on automatic screw machinery and tools will shortly be open for engagement ; expert on caming labor-saving tools for anything made in rod stock ; accustomed to handling men, and a cost reducer. Box 1811, Bridgeport, Conn.

A gentleman (German), now living here, who speaks English and French, has had large experience in European and American business affairs, and resided in Russia for several years, would like to represent some good houses at the Paris Exposition or in Europe generally ; best references. Box 150, American Machinist.

Help Wanted.

Wanted—Young man having had some experience in mechanical drawing. Box 147, American Machinist.

Wanted—First-class toolmaker ; state where last employed, age, experience and wages expected. Box 144, American Machinist.

Wanted—Toolmakers on tools for small interchangeable work ; state age, experience and wages expected. Box 114, Amer. Mach.

Wanted—A first-class machine blacksmith, one accustomed to heavy steam-hammer work. Address, with references, Box 154, Am. Mach.

Draftsman.—Mechanical draftsman, accustomed to steam machinery ; state age, experience and salary expected. Box 146, A. Mach.

Wanted—Foreman for brass-finishing shop, on valves, plugs and special brass work ; none but experienced man need apply. Box 145, American Machinist.

Foreman molder wanted on good machine castings in green and dry sand, to compete with the market in quality and price. N. B., 703 Beard Building, New York.

(*Continued on page* 38.)

Personal.

Samuel Hollingsworth, has resigned his position as designing draftsman of the Campbell Printing Press and Manufacturing Company, Plainfield, N. J.

B. Esmarch, an engineer formerly connected with Gustav Diechmann & Son, of Berlin, Germany, has resigned his position and taken a place as superintendent, with a seat on the Board of Directors, of the "Corona" Cycle and Metal Works Company, Limited, Brandenburg, near Berlin.

Louis B. Weber, who for some time has been in the office of The Lodge & Shipley Machine Tool Company at Cincinnati, has been placed in charge of their New York office, at 253 Broadway. It is the intention of Mr. Weber to make a special study of those foreign fields not covered by their present representatives, such, for instance, as South America, Africa, Cuba, etc.

Obituary.

James Mendenhall, a machinist, who had been in the employ of the Baldwin Locomotive Works, Philadelphia, for sixty-one years, died in that city January 20, eighty-four years old. He was for many years a contractor for making pistons in the works.

Inquiry for Machinery.

(119) Names and addresses of manufacturers of rotary counters with sharp relief figures cut in steel to make stamped records on moving slip of paper without ink, or flat-faced relief figures in steel or hard rubber to be used with typewriter ribbon. Counters should be not more than 1 inch diameter and 1⅛ inches long, and capable of registering up to 999,999 or 99,999.

At the opening session of the forty-seventh annual meeting of the American Society of Civil Engineers, recently held in New York, the following officers were elected to serve during the coming year: President, John Findlay Wallace, Chicago; vice-presidents, Rudolph Hering, New York, and Alfred Noble, Chicago; treasurer, Joseph M. Knap, New York; directors, John F. O'Rourke and Henry B. Seaman, New York; Thomas H. Johnson, Pittsburgh; Joseph Ramsey, Jr., St. Louis; Henry B. Richardson, New Orleans, and George A. Quinlan, Houston, Texas.

In a press report it is stated that, owing to the inability to procure iron, the foundry of A. H. McNeal Pipe & Foundry Company, of Burlington, N. J., has been obliged to be shut down. The foundry employs between 600 and 800 men, and had orders booked sufficient to keep the foundry running on full time for a long time to come, but no material can be obtained.

Help Wanted—Continued.

Wanted—Working tool-room foreman, experienced on tools for valves and fittings; state age, experience and wages expected. Box 138, AMERICAN MACHINIST.

Wanted—First-class brass pattern maker; one well accustomed to engineers' and plumbers' brass patterns; state experience. Address Box 143, AMERICAN MACHINIST.

Wanted—A first-class toolmaker and several first-class general machinists; steady work if satisfactory, and good pay. Apply at Fulton Foundry & Machine Works, 21 Furman st., Brooklyn, N. Y.

Wanted—As head foreman, a thoroughly reliable mechanic who can handle men and work to advantage; we build special machinery and presses of every description. Box 113, AMERICAN MACHINIST.

Wanted—Mechanical draftsman for New York city; must have experience on automatic machinery. Address letters, stating age, experience and salary wanted, to Box 148, AMERICAN MACHINIST.

Wanted—A stenographer in this office, used to mechanical terms; man having experience in machine-tool shop preferred. Address AMERICAN MACHINIST, Business Office, 218 William st., New York City.

Wanted—First-class mechanical engineer and draftsman; one who has had large experience in electric traveling cranes preferred; good salary and permanent position. Box 149, AMERICAN MACHINIST.

Wanted—2 or 3 first-class general machinists on light tool making, small auto. machinery, jigs, fixtures, etc.; state age, experience and wages expected. Address American Optical Co., Lensdale Works, Southbridge Mass.

Wanted—By a manufacturing company, 50 miles from Chicago, six good machinists to work on moderately light machinery; steady employment and the best wages will be given to the right men. Address promptly Western Cane Seating Co., Michigan City, Ind.

We are enlarging our works, and will shortly require an increased number of skilled mechanics; we invite application from draftsmen, pattern makers, molders and machinists. Address the Westinghouse Machine Company, East Pittsburgh, Pa.

Wanted—Chief engineer for large manufacturing plant in New Jersey, 3,000 horsepower, various types and engines; must be first-class man, well versed in theory and practice. Answer, stating age, experience and salary required, "Xenia," AMER. MACHINIST.

Wanted—First-class machinists, familiar with floor work in erecting heavy pumping engines, hoisting engines and air compressors; good wages; steady work; modern equipped shop. Apply in person, Fraser & Chalmers, 12th st. and Washtenaw ave., Chicago, Ill.

Wanted—Foreman for machine shop who has had experience in handling men, and the manufacture of special piercing and forming dies, reamers, tit punches, etc., also fine machine tools; only men of good ability need apply; position permanent. Address Foreman, care AMERICAN MACHINIST.

Wanted—By a machine shop in Central Ohio, a hustling, first-class superintendent, full of good ideas for simplifying the manufacture of specially designed light and heavy work; must be able to handle about 80 men successfully; sober, industrious, truthful, age 32 to 48, with large experience; good wages paid right man; state fully your capabilities and reasons for quitting your present position; none but competent persons need apply; answers made only to those thought to fill the requirements; all correspondence treated confidentially. Address "K. L.," care AMERICAN MACHINIST.

MECHANICAL ENGINEERS AND DRAFTSMEN

WANTED.

Capable and Experienced Men should become acquainted with us.

Our business is to secure good positions for first-class mechanical, civil and electrical engineers and draftsmen. WRITE US, stating your experience briefly, and we will send you the necessary papers to be filled out in full.

The Engineering Agency,
1605 Monadnock Block, CHICAGO, U.S.A.

CLEVELAND GEAR WORKS,
W. R. SAWYER, Lessee.
86 SENECA STREET,
CLEVELAND, O.

GEARS of all descriptions.

MECHANICAL Draftsmen Wanted

Men familiar with Electrical Machinery Preferred.

Write X Y Z, LYNN, MASS.

DUPLICATE ORDERS

for CROSS OIL FILTERS are of frequent occurrence, and are pretty good proof that CROSS OIL FILTERS are "all they're cracked up to be." Our Catalog gives a long list of representative concerns who have placed their second, third or fourth orders. Shall we send you a filter on 30 days' trial?

Send for Catalog 16.

THE BURT MFG. CO.,
255 Main St.
AKRON, OHIO, U. S. A.

Largest Manufacturers of Oil Filters in the World.

SATISFACTION

Is what you get when using our

NEW EXTRA RAPID

Blue Print Paper. A trial will cost you almost nothing. Write us.

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The Mackey Company, Ltd.,
DRAWING MATERIALS,
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SEALS-MACH. PLATES-CHECKS
BRIDGEPORT, CONN.

D. Saunders' Sons ....

Steam and Gas Fitters' Hand Tools

Send for Circular.

24 Atherton St.,
Yonkers, N. Y.

Manufacturers of
Pipe-Cutting,
Threading and
Tapping
Machines,

The Patent Wheel Pipe Cutter shown in the cut combines simplicity with strength and lightness. Easily adapted to various sizes of pipe. Rolling instead of sliding motion. No loose parts to become detached and mislaid. All wearing surfaces are of tool steel hardened. Less friction of parts than any other pipe cutter made.